

Appendix A:

Description of Sampling Strategy

The inspection sample for this study includes 684 developments containing 229,973 units in 219 housing authorities and is representative of the *vast majority* of developments nationwide—1,194,370 out of a total of 1,206,467 units.

The inspection sample for this study is composed of two samples drawn separately: the original sample, consisting of 625 developments in 199 housing authorities; and a supplemental sample consisting of 59 developments in 23 housing authorities. The supplemental sample included 16 additional inspections from developments in New York City, Puerto Rico and Chicago (housing authorities which were in the original sample). Therefore, excluding any double counting of housing authorities, the total sample size upon which our analysis is based is 684 developments in 219 housing authorities.

This appendix is organized in six sections:

- sampling strategy overview;
- selection of the housing authorities and developments for the original sample;
- revisions to the original sample of housing authorities and developments after it was drawn and fielded;
- selection of the supplemental sample;
- summary of the final sample, including both the original and supplemental components;
- adjustments made to the inspection universe estimates to account for exclusions.

I. Sampling Strategy Overview

The original statement of work for this study specified that about 625 developments were to be inspected in about 200 housing authorities. In each sampled development, between one and three buildings and between one and three units were to be sampled. The housing authorities were to be stratified by region, size, and PHMAP rating. Developments were to be stratified by family-elderly status and either vacancy rate or a combination of 1985 backlog estimate and post-1985 modernization expenditures. Certain types of developments were to be excluded: small developments in large housing authorities (because they are not typical), and certain types of scattered-site developments (because they are expensive to field). Each sampled development was to be given a probability of selection proportional to its number of units.

In close consultation with the HUD GTM, we developed a sampling approach that achieved the type of

sample allocation required by HUD. The sampling plan we used is a multiple-stage probability sample based on probability-proportional-to-size (PPS) sampling, where size is indicated by the number of units available in the housing authority. This resulted in the selection of 647 developments in 205 housing authorities—more than the number required, in order to provide a replacement sample should some developments and housing authorities prove to be ineligible or not respond. In fact, some housing authorities and developments did drop out after the sample was drawn, as described in a later section of this appendix.

Rather than stratifying and pre-specifying the number of authorities by region/size class, we used an *implicit* stratification approach by sorting the list of authorities by region, size category and vacancy category so that the systematic selection process naturally picked up a representative sample.

The original universe file provided by HUD included 1,308,050 units. Several important exclusions to the study universe were made.

- Because the study was intended to estimate the capital needs of developments likely to remain in the stock (as opposed to being demolished or replaced) and funded through the Capital Fund, developments with approved demolition plans, completed demolitions, or approved HOPE VI implementation grants were ***excluded*** from the study universe (77,743 units in 303 developments). The study universe was defined in August 1997, and the sample was drawn in September 1997. All properties with approved demolition plans, completed demolitions, or approved HOPE VI implementation grants as of December 1997 also were excluded from the study universe. Further reductions to the estimated universe were made when inspectors identified other ineligible properties in the field (January - May 1998).¹ Because their capital needs are not addressed through the Capital Fund, Indian Housing Authorities were also excluded from the sampling universe.
- In order to eliminate prohibitively expensive data collection costs the study universe ***included*** only developments located in the contiguous 48 states, the District of Columbia, and Puerto Rico (i.e., all 12,097 units in Alaska, Hawaii, Guam, and the U.S. Virgin Islands were excluded). For the same reason, the study universe also ***excluded*** scattered-site developments (39,641 units in 593 developments) and Turnkey developments (566 units).

After the exclusions described above, the sampling universe consisted of 1,178,003 units in 12,611 developments in 3,144 housing authorities. While on site the inspectors identified additional properties

¹ The initial sample exclusions decreased the universe by about 120,000 units. The inspectors identified 22 ineligible properties once they were in the field. Six had received FY 1998 HOPE VI implementation grants or had approved demolition plans, 11 were no longer public housing, and 5 were scattered-site unit acquisition developments. These 22 properties represent about 40,000 units nationwide.

that should have been excluded because they received 1998 HOPE VI implementation grants or were no longer public housing. Following these additional exclusions, the estimated sampling universe was 1,133,963 units.

As described in Section VI below, we increased the weights for some family developments in order to compensate for scattered-site developments, units in HOPE VI developments that were not included in the HOPE VI rehabilitation, and any units not slated for demolition in developments with approved demolition plans. Following these adjustments, the inspection universe included 1,194,370 units, which are all included in the inspection-based estimates of need. To provide a full picture of national needs, we also included all developments in Alaska, Hawaii, Guam and the U.S. Virgin Islands for a total universe estimate of 1,206,467 units.

II. Selection of the Original Sample

This section describes the approach for selecting specific housing authorities and developments for the study's original sample.

A. Selecting Housing Authorities to be Sampled

The selected sample was composed of the “base” sample of 200 housing authorities (as originally required by HUD) and a replacement sample of 5 housing authorities. The replacement sample was intended to compensate for both ineligible housing authorities and non-respondents. We pursued all 205 housing authorities, recognizing that our final sample might be slightly more or less than 200 depending on the actual number of ineligibles and non-respondents that we found.

Housing authorities were selected with probability proportional to size (PPS). Some large authorities were selected with certainty. In the first stage, all housing authorities with more than 5,746 units were selected with certainty (units in the universe / housing authorities to be selected, or $1,178,003 / 205 = 5,746$). This yielded 17 “certainty sites.” We then iteratively identified additional certainty sites. To do this we had to specify a new threshold size (above which a site would be picked with certainty) for the next iteration. This threshold was specified by the same ratio that governed the first iteration (units remaining in universe / remaining housing authorities to be selected out of 205), net of the previous iterations' selected housing authorities. So for the next iteration, the new size threshold was 4,546 or the ratio of $[(\text{total units} - \text{units in certainty sites previously selected}) / (205 - \text{number of certainty sites previously selected})]$. The final sample included 25 certainty sites. Together, these account for 408,368 units, or 34.7 percent of the total universe.

The remaining, “non-certainty” housing authorities were selected with probability proportional to size.

In order to ensure representativeness along dimensions of interest to HUD, before selection the housing authorities were sorted by region, and within region by size category (<250 units, 250-1249, 1250-4546) and vacancy category (<=10% >10%). The sorting was back-to-back (high to low, low to high) to further guarantee representativeness.

B. Selecting the Allocation of Developments to be Sampled

The first step in selecting developments was to determine how many developments to select within each type of housing authority. As with housing authorities, we constructed a replacement sample of developments. Thus the sample of developments included the base sample of 625 developments as originally required by HUD, plus a replacement sample of 22 developments. The replacement sample consisted of 12 extra developments in the 5 replacement non-certainty housing authorities, and 10 extra developments to compensate for developments that might be identified as ineligible once inspectors began their work. For example, we expected that inspectors could encounter properties that received new HOPE VI implementation grants, or large scattered-site developments that were not identified as such on the sampling-frame files. As shown in Exhibit A-1 and described further below, the total sample of developments including both the base sample and the replacement sample was:

Exhibit A-1: Allocation of Original Developments by Housing Authority Type

Housing Authority Type	Number of Housing Authorities	Number of Developments in Base Sample	Number of Developments in Replacement Sample	Total Number of Developments in Sample
New York City	1	40	2	42
Other Certainty	24	177	4	181
Non-Certainty:				
Original	175	408	4	412
Replacement	5		12	12
Total Non-Certainty	180	408	16	424
Total All	205	625	22	647

Base Sample. For the base sample, we allocated 34.7 percent of all sample developments (217) to the certainty sites because this group represents 34.7 percent of all public housing units. HUD decided that because New York City represents such a large portion of all public housing units (13 percent) it was unnecessary to allocate sample to New York City in proportion to its size. Doing so would have yielded a sample of 81 developments in New York City. Instead, only 40 developments were to be inspected in New York City (this represents 6 percent of sampled developments). The remaining 177

developments allocated to the certainty sites were sampled from the other 24 sites in proportion to their size.

The under-sampling of New York City necessarily implies a slight over-sampling of developments in the remaining certainty sites. They represent 22 percent of all units in the universe, but 28 percent of the sample of developments. In other words, the sample compensated for under-sampling in New York City by a corresponding over-sampling in the other certainty sites. For national projections, all developments were weighted based on the inverse of their probability of selection.

The remaining base sample included 408 properties allocated to the non-certainty sites (65.3 percent of 625).

Replacement Sample. For the development-level replacement sample, we selected 12 developments in the 5 extra non-certainty sites. We also selected 10 developments across all categories of housing authorities to cover sample losses that may result from ineligible developments that were to be identified in the field. These could be due to new HOPE VIs funded (estimate of 5 in our sample), new demolitions (estimate of 3 in our sample), and large scattered sites that were not originally identified (estimate of 2 in our sample).

Based on discussions with HUD staff on the likely locations of ineligible properties, 2 of these additional 10 properties were allocated to New York City, 4 to the remaining certainty sites and 4 to the non-certainty sites.

C. Selection of Specific Developments to Inspect

After determining the number of developments we would sample in each housing authority category, we proceeded to select specific developments. A two-stage development sample strategy was required to ensure that we would obtain the exact number of developments desired. The requirement for the sample was to select 205 housing authorities and 647 unique developments. We considered three categories of developments: those in New York City, those in the remaining (non-New York City) certainty sites, and those in non-certainty sites. In the first stage we over-sampled developments in each of these three categories: 50 in New York City, 200 in the remaining certainty sites, and 540 in the non-certainty sites. In the second stage, we randomly subsampled from each of the three categories to get the exact number of properties required for each group. This resulted in 42 developments drawn from New York City, 181 from the other certainty sites, and 424 from the non-certainty sites—647 in all. Selection from the certainty sites and non-certainty sites is discussed in more detail below.

Non-Certainty Sites. For the non-certainty sites we selected 3 developments from each of the 180 non-certainty sites for a total of 540 potential developments from this group. However, because some housing authorities had fewer than 3 developments, and others had some very large developments that

were larger than the sampling interval, some properties were essentially selected more than once. The number of unique projects selected in the first stage was 474. Since we wanted to identify 424 unique properties for inspection, the properties with multiple "hits" received double or triple weights rather than decrease the number of properties selected in Stage 1. At the second stage this group of 474 properties was randomly subsampled to the required number of 424 developments, and properties had weights of 1, 2 or 3 depending on how many times they were selected in the first-stage sample.¹

Certainty Sites. Within the certainty sites excluding New York City, we began with a selection of 200 properties. Because of multiple "hits," this actually consisted of only 197 unique properties. In the second stage these were randomly subsampled to the required 181.

In New York City we started with 50 properties in the first stage, and randomly subsampled to the required 42 properties in the second stage. There were no multiple "hits" in the first stage in New York City.

All selections from the base and replacement samples were fielded. No other corrections were made for ineligibles.

Treatment of Non-respondents. As noted above, our sample included 5 additional housing authorities to allow for some attrition of housing authorities due to ineligibility or refusal to participate. It would have been very difficult to add additional housing authorities to the inspection sample once the field effort was underway, thus the additional 5 housing authorities were the only correction made.

For each development we pre-selected a replacement for each property, randomly selecting the property listed above or below the selected one *within the same housing authority*. If there were no additional properties in the housing authority when we encountered a non-respondent, then the housing authority was dropped. Our selection of 5 extra housing authorities was made to allow for this type of attrition.

D. Summary Comparison of Universe and Sample Characteristics

How well did the sample mirror the sample universe in the end? In Exhibit A-2, we compare the *weighted* sample (where the weights are equal to the inverse of selection probabilities) with the universe of units. Given that our sampling approach was intended to reflect the universe of units in the stock, it is clear from Exhibit A-2 that our sample represented the universe well. Exhibits A-3 and A-4 compare the universe of housing authorities (A-3) and developments (A-4) with the sample. Consistent with

¹ The second stage subsampling of developments eliminated 3 of the 180 non-certainty sites. These were sites that had just one development that was not selected in the second stage development sample.

probability proportional to size sampling for both housing authorities and developments, Exhibit A-3 shows that large and extra-large housing authorities were over-represented in the sample, and Exhibit A-4 shows

Exhibit A-2: Comparison of Original Sampling Universe and Weighted Original Sample, in Unit Terms

	Sampling Universe		Universe Estimate Based on Sample (Weighted)	
	Number	Percent	Number	Percent
<i>Units by Region</i>				
Northeast	430,908	36.6	431,634	36.7
South	439,973	37.3	439,982	37.4
Rest	307,122	26.1	303,697	25.8
Total	1,178,003		1,175,312 ^a	
<i>Units by Average Bedroom Size</i>				
1.5 BRs or less	347,459	29.5	331,822	28.2
More than 1.5 BRs	830,054	70.5	843,491	71.8
Total	1,178,003		1,175,312	
<i>Units by Development Size</i>				
Less than 300 units	832,399	70.7	825,867	70.3
300 or more units	345,604	29.3	349,446	29.7
Total	1,178,003		1,175,312	
<i>Units by Development Vacancy Rate</i>				
Vacancy rate 10% or less	971,174	82.4	983,092	83.6
Vacancy rate more than 10%	206,829	17.6	192,220	16.4
Total	1,178,003		1,175,312	
<i>Units by Authority Size</i>				
Less than 250 units	205,384	17.4	197,572	16.8
250 -1249 units	327,801	27.8	336,191	28.6
1250 - 6600 units	290,955	24.7	289,060	24.6
More than 6600 units	197,431	16.8	196,058	16.7
New York City	156,432	13.3	156,432	13.3
Total	1,178,003		1,175,312	

- a The weighted number of units does not equal the total universe because, as described above, as part of the second stage sampling of developments, a random sample of properties was selected. At this point the probability sample diverged from actual measurement because some of the sampled properties had been selected once, some twice, and some three times.

Exhibit A-3: Description of Original Sampling Universe and Original Sample of Housing Authorities

	Sampling Universe		Sample	
	Number	Percent	Number	Percent
<i>Housing Authorities by Region</i>				
Northeast	500	15.9	57	27.8
South	1,512	48.1	85	41.5
Rest	1,132	36.0	63	30.7
Total	3,144 ^a		205	
<i>Housing Authorities by Average Bedroom Size</i>				
1.5 BRs or less	1,166	37.1	45	22.0
More than 1.5 BRs	1,978	62.9	160	78.0
Total	3,144		205	
<i>Housing Authorities by Authority Size^b</i>				
Less than 250 units	2,358	75.0	48	23.4
250 -1249 units	654	20.8	77	37.6
1250 - 6600 units	117	3.7	65	31.7
More than 6600 units	14	0.4	14	6.8
New York City	1	0.0	1	0.5
Total	3,144		205	
<i>Housing Authorities by Development Vacancy Rate</i>				
Vacancy rate 10% or less	2,612	83.1	151	73.7
Vacancy rate over 10%	532	16.9	54	26.3
Total	3,144		205	

a Excludes developments in Alaska, Hawaii, Guam and the U.S. Virgin Islands.

b Authority size is measured as the sum of units available in all eligible developments in the authority. Excluded from the size measure are developments with approved demolition plans, developments with an approved HOPE VI implementation grant, and scattered-site developments with over 300 units.

Exhibit A-4: Description of Original Sampling Universe and Original Sample of Developments

	Sampling Universe		Sample	
	Number	Percent	Number	Percent
<i>Developments by Region</i>				
Northeast	2,799	22.1	209	32.3
South	5,702	45.2	262	40.5
Rest	4,130	32.8	176	27.2
Total	12,611 ^a		647	
<i>Developments by Average Bedroom Size</i>				
1.5 BRs or less	4,213	33.4	184	28.4
More than 1.5 BRs	8,398	66.6	463	71.6
Total	12,611		647	
<i>Developments by Development Size</i>				
Less than 300 units	12,041	95.5	472	73.0
300 or more units	570	4.5	175	27.0
Total	12,611		647	
<i>Developments by Development Vacancy Rate</i>				
Vacancy rate 10% or less	10,637	84.3	526	81.3
Vacancy rate over 10%	1,974	15.7	121	18.7
Total	12,611		647	

a Excludes developments in Alaska, Hawaii, Guam and the U.S. Virgin Islands, as well as developments with approved HOPE VI or Demolition Plans and scattered-site developments.

that large developments were over-represented. However, as is evident from Exhibit A-2, our weighting procedures ensured a sample that was representative of the universe of public housing units.

III. Revisions to the Original Sample

Some changes—attrition and replacements—occurred to the sample from the time it was drawn through the time the physical inspections were completed and the data were cleaned. These accounted for a decrease of 6 housing authorities and 22 developments between the sample originally drawn and that used for the analysis. Changes are summarized in Exhibit A-5.

Exhibit A-5: Revisions to the Original Sample

Housing Authority Type	Initial Sample		Revised Sample	
	Housing Authorities	Developments	Housing Authorities	Developments
New York City	1	42	1	42
Other Certainty	24	181	24	175
Non-Certainty	180	424	174	408
Total	205	647	199	625

A. Revisions to the Sample of Housing Authorities

Recall that we selected 205 housing authorities initially. Three small housing authorities dropped out because they had no developments selected in the second stage sample (they each had only one small development—100 units or fewer—selected in the first stage sample, but not in the second stage sample). These housing authorities included:

- KS037 - Wellington Housing Authority
- KY149 - Housing Authority of Martin County Housing
- NE030 - Fairbury Housing Authority

Consequently, inspections were actually fielded in only 202 housing authorities.

Three other housing authorities were excluded from the final sample because inspectors found that *all* of their developments were ineligible (e.g., their developments were no longer traditional public housing). These housing authorities were:

- OH016 - Mansfield Housing Authority
(Turtle Creek Apts. was dropped because it had been converted to Section 8)
- MO005- Housing Authority of the City of Kinloch
(Dunbar Gardens was dropped because it had been approved for demolition)
- MS095- South Delta Regional Housing Authority
(Indianola and Rolling Fork were both converted to Section 8)

B. Revisions to the Sample of Developments

The original sample contained 647 developments. This was subsequently adjusted to account for ineligible developments and replacements. In total, 22 developments were dropped from the sample and were not replaced because they were ineligible for the study. These are summarized below:

- Sixteen developments were identified as HOPE VI sites or were no longer part of HUD's public housing stock (because they had been sold, converted, or demolished). They are:

Development	Reason for Ineligibility
1. AR004007-Highland Park	Demo/Disposition
2. DC001038 -Eastgate Gardens	In Process of Being Demolished
3. IL100001 - Coles County HA	Sect. 23 leased conversion, now public housing under a different project code.
4. IL003001 -Warner Homes	HOPE VI
5. MO002018 - Heritage House	HOPE VI
6. MO005003 - Dunbar Gardens	Demo/Disposition
7. MS095001 - Indianola	Section 23 leased, converted to Section 8
8. MS095008 - Rolling Fork	Converted to Section 8
9. NC012007 - Kimberly Park Terrace	HOPE VI
10. NJ003002 - Pioneer Homes	HOPE VI
11. NJ021002 - Brook Sloate Terrace	Sold to Homeownership Program
12. OH016004 - Turtle Creek Apts.	Converted to Section 8
13. PA002051- Whitman	Turnkey
14. PA006002 - McKees Rocks Terrace	HOPE VI
15. RQ005084 - Los Crisantes I and II	Demolished - funding source unknown
16. TN005010 - Vine Hill	HOPE VI

- One property (Moses White Estates - FL003027) was not inspected because it was 100 percent offline.

- Five developments were dropped without replacement from the sample because they were *scattered-site unit acquisitions*; that is, the housing authority maintains only the unit, not the building or site. The condo association fee, which is paid by the housing authority, is used for capital improvements to the building or site. There are approximately 2,800 units of this type of housing in the Maryland area. Because this type of development is atypical of the traditional housing stock, the formula model would not be applicable. These developments were:

1. MD002089 - Housing Authority of Baltimore City
2. MD002040 - Housing Authority of Baltimore City
3. MD004024 - Montgomery County Housing Authority
4. MD004027 - Montgomery County Housing Authority
5. VA004016 - Park Place

The net result of these changes to our sample is that our list of inspected developments dropped to 625 (647-22). This is summarized in Exhibit A-6 below.

Exhibit A-6: Summary of Revisions to Original Sample of Developments

	Number of Developments
Original Sample	647
- Received FY 1997 HOPE VI Implementation or Demolition Grants	6
- No longer public housing stock	10
- Scattered-site unit acquisition developments	5
- Property is 100% offline but has not received demolition funding (not inspected)	1
Final Sample	625

There were several other changes to the sample which, while not affecting the sample size, did represent departures from our original plan. One housing authority refused to let us inspect two of their developments that were in the original sample, but allowed us to inspect the two replacement developments from its authority. These were:

Dropped:

Replaced by:

1. DC001004 - Frederick Douglas
2. DC001014 - Stanton Dwelling

DC001019 - Kenilworth Courts;
DC001043 - Potomac Gardens.

Two properties remain in our sample but had limited inspections for reasons specified below:

- | | |
|-----------------------------|---|
| 1. OH004021 - The President | Undergoing major CGP modernization. |
| 2. MD002025 - The Broadway | Has an off-line high-rise and several on-line garden buildings. The inspection included only the stock remaining on-line. |

IV. The Supplemental Sample

After the original sample described above had been selected, additional funding permitted HUD to supplement the study with additional housing authorities and developments. In particular, HUD wanted to select more developments representative of very small housing authorities (those with fewer than 250 units), and very large housing authorities (Puerto Rico, Chicago, and New York City). A sample of 60 developments in 23 housing authorities was selected, using the same sampling strategy described above for the original sample.

Although we selected 60 developments, we only obtained inspection data from 59 developments. The reason is that one property from a small housing authority in Illinois appeared to be two different properties when we drew the sample (it had two different project codes and different names), but turned out to be a one-building development.

The supplemental sample is summarized in Exhibit A-7.

Exhibit A-7. Supplemental Sample, Completed Inspections

Type of Housing Authority	Number of Housing Authorities	Number of Developments
New York City	1	8
Puerto Rico	1	6
Chicago	1	2
Small Housing Authorities with Less Than 250 Units	20	43
Total Supplemental Sample	23	59 ^a

a Note: One property selected had two different project codes, and different names, but turned out to be a one-building development.

The supplemental sample was combined with the original one and the development weights adjusted to

provide a unified, nationally representative sample.

V. Summary of Entire Sample

Exhibit A-8 summarizes the combined sample, consisting of the original and supplemental samples. Exhibit A-9 lists all housing authorities and developments in the combined sample.

As a result of the ineligible properties identified during the inspection process, we updated the estimates of the sampling universe. Each dropped property represents other similar properties in the universe. Thus, Exhibit A-10 presents our original estimate of the sampling universe, our revised estimate of the sampling universe based on inspection results, and a summary of the final combined sample.

Exhibit A-8. Summary of the Combined Sample (Original and Supplemental)

	Original Sample		Supplemental Sample		Combined Sample	
	# Housing Authorities	# Developments	# Housing Authorities	# Developments	# Housing Authorities	# Developments
Non-certainty Sites						
< 250 units in HA	43	83	20	43	63	126
Other non-certainty	131	325	0	0	131	325
Certainty Sites						
New York City	1	42	1	8	1 ^a	50
Chicago	1	19	1	2	1 ^a	21
Puerto Rico	1	39	1	6	1 ^a	45
Other certainty sites (>4546 units)	22	117	0	0	22	117
Total	199	625	20 ^a	59	219	684

^a The New York, Chicago, and Puerto Rico housing authorities were contained in both the original and supplemental samples. The numbers represented in the total columns for the supplemental sample and total sample count them only once.

Exhibit A-9: The Final Sample of Housing Authorities and Developments

Developments from Housing Authorities with Fewer than 250 Units

AL009	HOUSING AUTHORITY OF THE CITY OF ATTALLA	UNITS	GA179	HOUSING AUTHORITY OF THE CITY OF BUENA VISTA	UNITS
AL009003	HANDY MANOR	64	GA179001	WOOTEN HOMES	32
AL009004	ALFORD COURT	46	GA179002	BROAD STREET HOMES	12
			GA179004	T.W. HOLLIS HOMES/MATTHEW	35
AL058	WINFIELD HOUSING AUTHORITY		GA185	HOUSING AUTHORITY OF THE CITY OF JACKSON	
AL058001	HIGHLAND COURTS	32	GA185001	TYLER TERR MALLETT PARK	37
AL058003	WESTWOOD HGHTS	44	GA185002	MALLETT PARK	52
AL058004	NORTH WESTWOOD HGHTS	76			
AL108	RAGLAND HOUSING AUTHORITY		IA022	IOWA CITY HOUSING AUTHORITY	
AL108001	MCDONNARD COURTS	20	IA022003	IOWA CITY	14
AL108002	MCDONNARD COURTS	20	IA022006	IOWA CITY HOUSING AUTHORITY	20
AL108003	MCDONALD COURTS	20			
AL137	HOUSING AUTHORITY OF THE CITY OF FAYETTE		IL108	HOUSING AUTHORITY OF THE COUNTY OF LAWRENCE, IL.	
AL137002	HOUSING AUTHORITY OF THE CITY OF FAYETTE	50	IL108001	LEWIS MANOR	75
AL137003	HOUSING AUTHORITY OF THE CITY OF FAYETTE	70	IL108003	LANTERMAN GILLESPIE	4
AL150	HOUSING AUTHORITY OF THE CITY OF CLANTON		IN039	ANGOLA HOUSING AUTHORITY	
AL150001	NORFIELD	80	IN039001	ELLIOTT MANOR	106
AL150002	WESTFIELD	48	IN039002	NORTHLAKE MANOR	79
AL150003	NORTH HAVEN	50			
AR066	RUSSELLVILLE HOUSING AUTHORITY		KS007	WASHINGTON HOUSING AUTHORITY	
AR066002	RUSSELLVILLE	38	KS007001	COLONIAL ACRES	50
AR066003	RUSSELLVILLE	60			
AR066004	RUSSELLVILLE HOUSING AUTHORITY	58	KS016	SOUTH HUTCHINSON HOUSING AUTHORITY	
			KS016001	SUNRISE ACRES	144
AR104	SPRINGDALE HSG AUTHORITY		KS077	GIRARD HOUSING AUTHORITY	
AR104001	PHILLIPS PLAZA	170	KS077001	WATER STREET APARTMENTS	24
CA009	HOUSING AUTHORITY OF THE CITY OF UPLAND		KY033	HOUSING AUTHORITY OF CATLETTSBURG	
CA009002	LOS OLIVOS	97	KY033001	FOREST HEIGHTS	53
			KY033002	GRANDVIEW MANOR	97
CA067	ALAMEDA COUNTY HSG AUTH		KY072	HOUSING AUTHORITY OF PRINCETON	
CA067007	ALAMEDA COUNTY HSG AUTH	18	KY072001	HILLVIEW CT	64
CA067008	SENIOR HOUSING COMPLEX	100	KY072002	HYACINTH VILLAGE	40
CA067013	MISSION VIEW APARTMENTS	42			
CA069	CITY OF MADERA HOUSING AUTHORITY		LA093	HOUSING AUTHORITY OF THE TOWN OF WHITE CASTLE	
CA069001	MADERA	48	LA093001	HOUSING AUTHORITY OF WHITE CASTLE	42
CA069003	MADERA	50	LA093002	HOUSING AUTHORITY OF WHITE CASTLE	58
CA069004	MADERA	34	LA093003	HOUSING AUTHORITY OF WHITE CASTLE	34
CO005	TRINIDAD HOUSING AUTHORITY		LA096	HOUSING AUTHORITY OF THE TOWN OF HAYNESVILLE	
CO005001	TRINIDAD	50	LA096001	HOUSING AUTHORITY OF HAYNESVILLE	60
CO005003	TRINIDAD	40	LA096002	HOUSING AUTHORITY OF HAYNESVILLE	60
CO044	HOUSING AUTHORITY OF THE CITY OF BRUSH		MA019	WOBURN HOUSING AUTHORITY	
CO044001	BRUSH	30	MA019001	SPRING COURT	100
CT009	MIDDLETOWN HOUSING AUTHORITY		MA059	PLYMOUTH HOUSING AUTHORITY	
CT009002	SBONA TOWERS	129	MA059001	HIGH CLIFF APARTMENTS	82
FL071	LAKE WALES HOUSING AUTHORITY		ME022	SOUTHWEST HARBOR HOUSING AUTHORITY	
FL071001	GROVE MANOR	140	ME022001	RIDGE APTS	32
FL071002	SUNRISE PARK	100	ME022002	NORWOOD COVE APTS	18
GA065	HOUSING AUTHORITY OF THE CITY OF WEST POINT		MI119	IRON COUNTY HOUSING COMMISSION	
GA065003	O. J. COOK APTS	109	MI119001	PLEASANT VALLEY APTS	43
GA065004	O. J. COOK APTS	28	MI119002	IRON COUNTY SCATTERED	19
GA074	HOUSING AUTHORITY OF THE CITY OF ELBERTON		MO011	HOUSING AUTHORITY OF THE CITY OF MOBERLY	
GA074001	HILLSIDE HMS	40	MO011001	ALLEN+DALE COUNTRY VIEW	150
GA074002	ELBERTA HOMES	65	MO011002	MOBERLY TOWERS	100
GA074006	FOUNTAIN HOMES	20			
GA080	HOUSING AUTHORITY OF THE CITY OF EASTMAN		MO021	HOUSING AUTHORITY OF THE CITY OF POTOSI	
GA080003	HARRELL AVENUE APARTMENTS	23	MO021001	LOOMIS HEIGHTS	94
GA080010	STUCKEY HOMES	50	MO021002	VALLEY VIEW HEIGHTS	22
GA098	HOUSING AUTHORITY OF THE CITY OF PELHAM		MS067	THE HOUSING AUTHORITY OF THE TOWN OF RICHTON	
GA098001	MARTHA U. TWITTY HOMES	32	MS067001	PA BOWEN APTS	8
GA098005	MIZE HOMES	100	MS067003	WALLEY/RICH RITCHIE	49
			MS080	THE HOUSING AUTHORITY OF THE CITY OF WALNUT	
			MS080001	WALNUT HOUSING AUTHORITY	22
			MS080002	WALNUT HA'S ALEXANDER APARTMENTS	12

Exhibit A-9: Final Sample of Housing Authorities and Developments *(continued)*

MS090	THE HOUSING AUTHORITY OF THE CITY OF SENATOBIA		OK106001	HOUSING AUTHORITY OF THE CITY OF LANGSTON	31
MS090001	SENATOBIA HOUSING AUTHORITY	42	OK106002	HOUSING AUTHORITY OF THE CITY OF LANGSTON	30
MS090002	SENATOBIA HOUSING AUTHORITY	33	OR005	HOUSING AUTHORITY OF LINCOLN COUNTY	
MS090004	SENATOBIA HOUSING AUTHORITY	44	OR005001	FIRCREST	30
			OR005002	OCEAN SPRAY	30
			OR005005	H.A. OF LINCOLN COUNTY	25
NC017	REDEVELOPMENT COMMISSION OF THE TOWN OF TARBORO		TN016	SWEETWATER HOUSING AUTHORITY	
NC017002	REDEVELOPMENT COMM TARBORO	50	TN016001	FAIRVIEW TERRACE	36
NC017003	REDEVELOPMENT COMM TARBORO	59	TN016002	NORTHWEST APARTMENTS	4
NC017004	REDEVELOPMENT COMM TARBORO	34	TN016004	HOUSING AUTHORITY SWEETWATER	61
ND002	HOUSING AUTHORITY OF THE CITY OF WILLISTON		TN031	MILAN HOUSING AUTHORITY	
ND002001	NOR-PARK HOMES	60	TN031002	NORTHSIDE TERRACE WEST	100
ND002002	WILLISTON	49			
ND002004	WILLISTON	20			
NE141	ALLIANCE HOUSING AUTHORITY		TN043	ROGERSVILLE HOUSING AUTHORITY	
NE141002	ALLIANCE HOUSING AUTHORITY	24	TN043002	JOHN R. CHILES MEMORIAL	50
NE141003	ALLIANCE HOUSING AUTHORITY	25	TN043004	FUGATE HILL	48
NE141004	ALLIANCE HOUSING AUTHORITY	10			
NH017	SALEM HOUSING AUTHORITY		TN045	MILLINGTON HOUSING AUTHORITY	
NH017001	MILLVILLE ARMS	75	TN045001	MILLINGTON HOUSING AUTHORITY	89
NH017002	TELFER CIRCLE	75			
NJ020	BURLINGTON HOUSING AUTHORITY		TX097	HOUSING AUTHORITY OF SAVOY	
NJ020001	COL EDWARD B STONE VILLA	90	TX097001	HOUSING AUTHORITY OF SAVOY	6
			TX097002	HOUSING AUTHORITY OF SAVOY	10
			TX097003	HOUSING AUTHORITY OF SAVOY	9
NM008	HOUSING AUTHORITY OF THE CITY OF RATON		TX283	HOUSING AUTHORITY OF GATESVILLE	
NM008001	HOUSING AUTHORITY OF THE CITY OF RATON	50	TX283001	HOUSING AUTHORITY OF GATESVILLE	60
NM008003	OPERATION BREAKTHROUGH	71	TX283003	HOUSING AUTHORITY OF GATESVILLE	24
NY044	GENEVA HOUSING AUTHORITY		TX383	HOUSING AUTHORITY OF SAN AUGUSTINE	
NY044001	ELMCREST APTS	91	TX383001	CEDAR HILLS	68
NY044010	GENEVA HOUSING Authority	124			
NY059	ILION HOUSING AUTHORITY		WI048	NEW LONDON HOUSING AUTHORITY	
NY059001	LONDON TOWERS	160	WI048001	FRANKLIN PARK APTS	63
NY086	NORTH HEMPSTEAD HOUSING AUTHORITY		WI204	SAUK COUNTY HOUSING AUTHORITY	
NY086006	NEW CASSEL SNR/MAGNOLIA	90	WI204001	SAUK CO FAMILY LOW RENT	15
			WI204002	WASHINGTON SQUARE	25
OK010	HOUSING AUTHORITY OF THE CITY OF DRUMRIGHT		WV015	HOUSING AUTHORITY OF THE CITY OF BECKLEY	
OK010001	HOUSING AUTHORITY OF THE CITY OF DRUMRIG	58	WV015002	BECKWOODS	60
OK010003	PENN OAKS	70	WV015003	EAST PARK	35
OK046	HOUSING AUTHORITY OF THE TOWN OF HYDRO		WY004	HOUSING AUTHORITY OF THE CITY OF CASPER	
OK046001	HOUSING AUTHORITY OF THE TOWN OF HYDRO	16	WY004001	HOUSING AUTHORITY OF THE CITY OF CASPER	36
			WY004002	HOUSING AUTHORITY OF THE CITY OF CASPER	24
OK106	HOUSING AUTHORITY OF THE CITY OF LANGSTON		WY004005	HOUSING AUTHORITY OF THE CITY OF CASPER	15

Developments from Housing Authorities with 250 to 1,249 Units

AL048	HOUSING AUTHORITY OF THE CITY OF DECATUR		AR016	CAMDEN HOUSING AUTHORITY	
AL048001	EAST ACRES	127	AR016002	CARVER COURTS	80
AL048002	CASHIN HOMES	105	AR016005	CAMDEN HOUSING AUTHORITY	60
AL048009	W T JORDAN APTS	82	AR016006	LINCON CTR RIVERSIDE CT	138
AL049	GREATER GADSDEN		AR027	HOUSING AUTHORITY OF THE CITY OF MARIANNA	
AL049001	COLLEY HOMES	224	AR027001	HOUSING AUTHORITY OF THE CITY OF MARIANNA	100
AL049003	EMMA SANSOM HOMES	220	AR027004	HOUSING AUTHORITY OF THE CITY OF MARIANNA	100
AL049005	CAMPBELL COURT	150			
AL057	SYLACAUGA HOUSING AUTHORITY		AZ009	MARICOPA COUNTY HOUSING DIVISION	
AL057001	DREW CT	102	AZ009001	COFFELT LAMOREAUX	296
AL057003	SYLAVON COURT	167	AZ009015	FATHER FIDELIS KUBAN	50
			AZ009019	VARNEY HOMES	12
AL077	HOUSING AUTHORITY TUSCALOOSA		CA039	HOUSING AUTHORITY OF THE CITY OF CALEXICO	
AL077005	ROBERTSON TOWERS	102	CA039002	H W GOING HOUSING PROJECT	30
AL077006	SAMUEL B HAY CT	186	CA039003	HIGUERA HOMES	50
AL077007	CRESCENT EAST/BRANSCOMB	284			
AL152	HOUSING AUTHORITY NORTHPORT		CT003	HARTFORD HOUSING AUTHORITY	
AL152002	EAST CIRCLE	70	CT003002	DUTCH POINT COLONY	186
AL152003	WEST CIR/VALLEY HLS/15TH	150	CT003011	BETTY KNOX APARTMENTS	199
AL152004	KNOLL/NORTHGATE/WEST CR	150	CT003015	HARTFORD SCATTERED SITE I	134

Exhibit A-9: Final Sample of Housing Authorities and Developments (continued)

CT023	BRISTOL HOUSING AUTHORITY		LA004005	LLOYD OAKS	150
CT023001	CAMBRIDGE PARK	200	LA005	HOUSING AUTHORITY OF THE CITY OF LAFAYETTE	
CT023003	JOHN F KENNEDY APARTMENTS	80	LA005004	LILLIAN ROAD	74
CT023004	BONNIE ACRES EXTENSION	60	LA005009	LAFAYETTE HOUSING AUTHORITY	92
FL007	HOUSING AUTHORITY OF THE CITY OF DAYTONA BEACH		LA024	BOGALUSA HOUSING AUTHORITY	
FL007002	HALIFAX PARK	62	LA024001	SUNSET ACRES	70
FL007011	MALEY APTS	150	LA024004	SUNSET ACRES ADDITION	22
FL010	HOUSING AUTHORITY OF THE CITY OF FORT LAUDERDALE		LA054	HOUSING AUTHORITY OF RUSTON	
FL010001	DIXIE COURT	149	LA054001	LOUISE DRIVE AND GREENWOOD HOMES	100
FL010003	SUNNYLAND HOMES	82	LA054002	TRUMAN DR. SITE B, MARYLAND PL. A	82
FL010005	SAILBOAT BEND	105	LA054003	EASTWOOD, FAM, MARYLAND PL., ELD.	108
FL057	PALATKA HOUSING AUTHORITY		MA008	CHICOPEE HOUSING AUTHORITY	
FL057001	PALATKA HOUSING AUTHORITY	200	MA008001	CABOT MANOR APT	150
FL057004	DR JAMES A LONG HOMES	84	MA008002	MEMORIAL APT	157
FL057005	ROSA RAGSDALE	96	MA008003	CANTERBURY ARMS APT	76
GA096	HOUSING AUTHORITY OF THE CITY OF CAMILLA		MA016	CHELSEA HOUSING AUTHORITY	
GA096003	JACKSON HOMES	8	MA016002	MACE APART. (CLINTON ST)	96
GA096008	WALKER HOMES	34	MA016004	MARGOLIS APART(CLARK AVE)	152
GA096014	JESTER HOMES	100			
IL007	ALEXANDER COUNTY HOUSING AUTHORITY		MD009	HOUSING AUTHORITY OF CRISFIELD	
IL007001	ELMWOOD PLACE	118	MD009001	SOMMERS COVE APTS	50
IL007002	MC BRIDE PLACE	158	MD009003	SOMMERS COVE APTS	100
IL007005	LOARN SHUEMAKER	43			
IL009	THE HOUSING AUTHORITY OF HENRY COUNTY		ME009	BANGOR HOUSING AUTHORITY	
IL009001	FAIRVIEW APTS	122	ME009001	CAPEHART	354
IL009004	WASHINGTON APTS	74	ME009004	NASON PARK MANOR	50
IL010	GRTR METRO. AREA HSNG AUTH OF ROCK ISLAND COUNTY		MI004	HAMTRAMCK HOUSING COMMISSION	
IL010001	OAK GROVE	97	MI004001	COLONEL HAMTRAMCK HOMES	300
IL010005	WILLIAM YOUNG HOMES	50	MI004002	HAMTRAMCK SENIOR PLAZA	150
IL010012	SILVIS	156	MI070	MARQUETTE HOUSING COMMISSION	
			MI070001	PINE RIDGE APTS	140
IL030	ST. CLAIR COUNTY HOUSING AUTHORITY		MO002	KANSAS CITY HOUSING AUTHORITY	
IL030006	MATHISON MANOR/JAMES	178	MO002005	RIVERVIEW	232
IL030010	CENTREVILLE	109	MO002013	BRUSH CREEK TOWERS	135
IL047	MACOUPIN COUNTY HOUSING AUTHORITY		MO018	HOUSING AUTHORITY OF THE CITY OF KENNETT	
IL047006	MACOUPIN COUNTY HOUSING AUTHORITY	6	MO018001	KENNETT HOUSING AUTHORITY	100
IL047008	MACOUPIN COUNTY HOUSING AUTHORITY	20	MO018003	KENNETT HOUSING AUTHORITY	30
IL047017	MACOUPIN COUNTY HOUSING AUTHORITY	20	MO018004	KENNETT HOUSING AUTHORITY	60
IL053	HOUSING AUTHORITY OF THE COUNTY OF JACKSON,IL.		NC022	HOUSING AUTHORITY OF THE CITY OF GREENVILLE	
IL053001	MURPHYSBORO	90	NC022002	KEARNEY PARK	160
IL053007	MURPHYSBORO	60	NC022006	NEWTOWN	78
IL053009	ELKVILLE	14			
IL061	HOUSING AUTHORITY OF THE COUNTY OF FRANKLIN		NC027	HENDERSONVILLE HOUSING AUTHORITY	
IL061001	WEST FRANKFORT HOUSING	176	NC027001	HENDERSONVILLE HOUSING AUTHORITY	149
IL061002	SESSER HOUSING	36	NC027004	ETOWAH FLETCHER	31
			NC027005	LINCOLN CIRCLE	50
IL100	HOUSING AUTHORITY OF THE COUNTY OF COLES		NC066	BURLINGTON HOUSING AUTHORITY	
IL100002	HOUSING AUTHORITY COUNTY COLES	200	NC066001	BURLINGTON HOUSING AUTHORITY	248
IN003	FORT WAYNE HOUSING AUTHORITY		NC066003	EARL-GEROW HOMES	50
IN003005	BEACON HEIGHTS	100	NJ004	NORTH BERGEN HOUSING AUTHORITY	
IN003010	TALL OAKS	105	NJ004002	LAWLER TWS	251
IN003015	RIVER COVE	74	NJ004003	TERRACE APTS	252
			NJ004004	CULLUM TWS	308
IN012	HOUSING AUTHORITY OF THE CITY OF NEW ALBANY		NJ013	PASSAIC HOUSING AUTHORITY	
IN012003	PARKVIEW	350	NJ013001	SPEER VLG	383
IN012006	PARKVIEW TOWERS	100	NJ013008	MAURICE J. MILLER APTS.	30
IN012007	RIVERVIEW TOWERS	164			
IN029	HOUSING AUTHORITY OF THE CITY OF EAST CHICAGO		NJ014	ATLANTIC CITY HOUSING AUTHORITY	
IN029001	JAMES HUNTER	109	NJ014003	BUZBY HOMES VLGE	122
IN029006	EAST CHICAGO HOUSING AUTHORITY	346	NJ014004	HOLMES VLGE	279
			NJ014005	ALTMAN TERR/INLET TWR	346
LA004	HOUSING AUTHORITY OF LAKE CHARLES		NJ032	RAHWAY HOUSING AUTHORITY	
LA004001	BOOKER T WASHINGTON CTS	72	NJ032001	GLENDENNING HMS	76
LA004002	HIGH SCHOOL PK HMS	72			

Exhibit A-9: Final Sample of Housing Authorities and Developments *(continued)*

NJ032004	WALTER SCHAFFHAUSER TOWER	40	SC035001	JULIAN GRANT HOMES	200
			SC035004	E GORDON ABLE HOMES	55
NJ037	IRVINGTON HOUSING AUTHORITY		SC057	HOUSING AUTHORITY OF N CHARLESTON	
NJ037001	CAMPTOWN GARDENS	126	SC057001	THREE OAKS/BUSKIRK	88
NJ037004	CAMPTOWN GARDENS	188	SC057004	NORTH PARK VILLAGE	533
NJ037005	CAMPTOWN GARDENS	241			
NJ039	PLAINFIELD HOUSING AUTHORITY		TN002	JOHNSON CITY HOUSING AUTHORITY	
NJ039002	ELMWOOD GRDNS	120	TN002002	KEYSTONE APARTMENTS	225
NJ039003	RICHMOND TWS	225	TN002007	PINECREST VILLAGE	100
NM001	ALBUQUERQUE DEPARTMENT OF FAMILY AND COMMUNITY SERVICES		TN015	ATHENS HOUSING AUTHORITY	
NM001013	608 GROVE-5609 GIBSON SE	78	TN015005	WESTWOOD HEIGHTS	55
NM001023	6109 COPPER NE	48	TN015007	FORREST HILLS	137
NY016	BINGHAMTON HOUSING AUTHORITY		TN027	HUMBOLDT HOUSING AUTHORITY	
NY016001	CARLISLE HILL	150	TN027001	ROSEDALE COURTS	60
NY016002	NORTH SHORE TOWERS	224	TN027002	FT. HILL CIRCLE	60
NY016005	SARATOGA APTS	267	TN027003	HAVEN HGTS/WESTSIDE CT	90
NY030	ELMIRA HOUSING AUTHORITY		TN039	SHELBYVILLE HOUSING AUTHORITY	
NY030001	HOFFMAN PLAZA	144	TN039001	PARKWAY APARTMENTS	109
NY030002	GEORGE E. BRAGG TOWERS	146	TN039003	RIDGEWAY APARTMENTS	50
NY030004	EDWARD FLANNERY APTS.	209	TN039007	BRITTANY HILLS APTS	60
OR001	HOUSING AUTHORITY OF THE COUNTY OF CLACKAMAS		TN058	GREENEVILLE HOUSING AUTHORITY	
OR001001	CLACKAMAS HEIGHTS	100	TN058001	EARL H. SMITH HOMES	126
OR001004	OREGON CITY VIEW MANOR	99	TN058003	WESLEY HEIGHTS HOMES	35
OR001007	CLACKAMAS COUNTY HOUSING AUTHORITY	33	TN058004	HIGHLAND HILLS VILLAGE	100
OR011	HOUSING AUTHORITY OF THE CITY OF SALEM		TX014	HOUSING AUTHORITY OF TEXARKANA	
OR011002	HOUSING AUTHORITY CITY OF SALEM	108	TX014001	BOWIE COURTS	120
OR011003	ORCHARD VILLAGE	30	TX014005	15TH STREET APARTMENTS	50
OR011006	PRINGLE CREEK	62	TX014006	ROBISON TERRACE	130
PA017	WASHINGTON COUNTY HOUSING AUTHORITY		TX018	HOUSING AUTHORITY OF LUBBOCK	
PA017003	FREDERICK TERRACE	70	TX018002	GREEN FAIR	215
PA017004	HIGHLAND TERRACE	95	TX018006	CHERRRY POINT/CONV-RENTAL	34
PA017012	CANONSBURG	18	TX037	HOUSING AUTHORITY OF ORANGE	
PA028	MONROE COUNTY HOUSING AUTHORITY		TX037001	PINE GROVE HOMES	98
PA028005	WEST GATE	99	TX037002	ARTHUR ROBINSON HOMES	70
PA028006	KISTLER PLAZA	45	TX037003	ARTHUR ROBINSON HOMES	88
PA046	HOUSING AUTHORITY OF THE CO OF CHESTER		TX078	HOUSING AUTHORITY OF SHERMAN	
PA046001	PARKWAY WOODLAND CTS.	46	TX078001	HOUSING AUTHORITY OF SHERMAN	298
PA046004	KING TERR FAIRVIEW VILL	75	VA001	PORTSMOUTH REDEVELOPMENT HOUSING AUTHORITY	
PA046005	222 N CHURCH OAK PLACE	107	VA001002	SWANSON HOMES	210
			VA001007	WASHINGTON PRK	160
PA047	WILKES BARRE HOUSING AUTHORITY		VA004	ALEXANDRIA REDEVELOPMENT HOUSING AUTHORITY	
PA047001	LINCOLN PLAZA	200	VA004003	SAMUEL MADDEN HOMES	100
PA047002	O KARMA TERRACE	198	VA004004	JAMES BLAND HOMES	148
PA047005	VALLEY VIEW TERRACE	209	VA025	SUFFOLK REDEVELOPMENT HOUSING AUTHORITY	
RI005	NEWPORT HOUSING AUTHORITY		VA025002	CYPRESS MANOR	113
RI005003	TONOMY HILL	498	VA025003	PARKER RIDDICK APARTMENTS	93
RI005005	DONOVAN MANOR	164	WA003	HOUSING AUTHORITY CITY OF BREMERTON	
RI015	WEST WARWICK HOUSING AUTHORITY		WA003001	WEST PARK	582
RI015001	W WARWICK MANOR	126	WA006	HOUSING AUTHORITY CITY OF EVERETT	
RI015003	CLYDE TOWER	124	WA006001	BAKER HEIGHTS	244
SC019	HOUSING AUTHORITY OF UNION		WA006002	GRANDVIEW HOMES	146
SC019001	COLUMBUS TILLMAN APT	86	WV003	HOUSING AUTHORITY OF THE CITY OF WHEELING	
SC019003	CHAMBERS AVE APTS	120	WV003002	GRANDVIEW MANOR	298
SC019005	HUNT DRIVE APTS	17	WV003004	HIL-DAR	100
SC035	HOUSING AUTHORITY OF NEWBERRY		WV003010	BOOKER T WASHINGTON	107

Developments from Housing Authorities with 1,250 to 4,545 Units

AL002	MOBILE HOUSING BOARD		AL006	HOUSING AUTHORITY OF THE CITY OF MONTGOMERY	
AL002006	GULF VILLAGE	198	AL006002	CLEVELAND COURT	150
AL002009	JESSE THOMAS HOMES	380	AL006012	GIBBS VILLAGE	500
AL002010	R V TAYLOR PLAZA	450			

Exhibit A-9: Final Sample of Housing Authorities and Developments *(continued)*

AR004	LITTLE ROCK HOUSING AUTHORITY		MI001027	WARREN WEST	138
AR004004	JOSEPH A. BOOKER	230	MI001028	CONNER WAVENEY	139
AZ001	CITY OF PHOENIX HOUSING DEPARTMENT		MN001	PUBLIC HOUSING AGENCY OF THE CITY OF SAINT PAUL	
AZ001002	FRANK LUKE	230	MN001001	MCDONOUGH HOMES	484
AZ001006	FRANK LUKE ADDN	138	MN001015	FRONT AVENUE HI-RISE	152
			MN001016	RAVOUX HI-RISE	220
CA005	CITY OF SACRAMENTO		MS040	MISSISSIPPI REGIONAL HOUSING AUTHORITY NO. VIII	
CA005001	816 REVERE STREET	300	MS040026	PECAN CIRCLE HOMES	72
CA005008	1725 K STREET	80	MS040027	PATTERSON HOMES	40
CA005013	1043 43RD AVENUE	28			
CO001	HOUSING AUTHORITY OF THE CITY AND COUNTY OF DENVER		NC003	HOUSING AUTHORITY OF THE CITY OF CHARLOTTE	
CO001008	SUN VALLEY HOMES	169	NC003002	FAIRVIEW HOMES	402
CO001015	A B HIRSCHFELD TOWERS	250	NC003011	BOULEVARD HOMES	300
CO001018	DENVER HOUSING AUTHORITY	69	NC003019	PARKTOWNE TERRACE	164
CT001	BRIDGEPORT HOUSING AUTHORITY		NC012	HOUSING AUTHORITY OF THE CITY OF WINSTON-SALEM	
CT001002	MARINA VILLAGE	364	NC012002	HAPPY HILL GARDENS	178
CT001005	P.T. BARNUM APTS.	360	NC012003	PIEDMONT PARK	240
CT001010	FIRESIDE APTS. EXT 2	248			
CT004	NEW HAVEN HOUSING AUTHORITY		NJ003	ELIZABETH HOUSING AUTHORITY	
CT004025	EDITH D JOHNSON TOWERS	96	NJ003001	MRAVLAGE MANOR	419
CT004031	WILLIAM T. ROWE	175	NJ003006	FORD LEONARD TWS	116
CT004036	BROOKSIDE	300			
FL003	TAMPA HOUSING AUTHORITY		NJ009	JERSEY CITY HOUSING AUTHORITY	
FL003009	CENTRAL PARK VILLAGE	472	NJ009002	MARION GRDNS	233
FL003012	J L YOUNG GARDEN	450	NJ009009	A HARRY MOORE APTS	644
GA007	HOUSING AUTHORITY OF THE CITY OF MACON		NJ010	CAMDEN HOUSING AUTHORITY	
GA007002	TINDALL HEIGHTS	294	NJ010002	WILLIAM S. ABLETT VILLAGE	306
GA007011	MCAFEE TOWERS	199	NJ010003	FRANK D. ROOSEVELT MANOR	268
			NJ010006	WESTFIELD ACRES	511
IL003	PEORIA HOUSING AUTHORITY		NJ012	BAYONNE HOUSING AUTHORITY	
IL003002	HARRISON HOMES	462	NJ012001	PAMRAPO GRDNS	108
IL003003	HARRISON HOMES - NORTH	154	NJ012007	HOOK VLG/KVK ANNEX	250
			NJ012008	BACK BAY GRDNS	252
IL022	ROCKFORD HOUSING AUTHORITY		NJ021	PATERSON HOUSING AUTHORITY	
IL022006	NORTH MAIN MANOR	187	NJ021003	A. HAMILTON DEVELOPMENT	486
IL022007	FAIRGROUNDS VALLEY	209	NJ021007	DR. NORMAN COTTON HOMES	115
IL022008	HOMEOWNERSHIP	127			
IN011	HOUSING AUTHORITY OF THE CITY OF GARY		NV002	CITY OF LAS VEGAS HOUSING AUTHORITY	
IN011004	DELANEY WEST	228	NV002009	ERNIE CRAGIN TERRACE	83
IN011025	GENESIS TOWERS	142	NV002021	ARTHUR E. SARTINI PLAZA	220
			NV002022	VERA JOHNSON MANOR	183
KY004	HOUSING AUTHORITY OF LEXINGTON		NY002	BUFFALO MUNICIPAL HOUSING AUTHORITY	
KY004004	BLUEGRASS PK ASPENDALE	269	NY002006	JASPER PARRISH PLACE	211
KY004008	PIMLICO APTS	206	NY002010	KENFIELD	629
KY004013	ATIYA PLACE/CAMELOT/WILSO	96	NY002021	SLATER CTS.	24
LA006	HOUSING AUTHORITY OF MONROE		NY009	ALBANY HOUSING AUTHORITY	
LA006006	BERG JONES LANE PRJCT	300	NY009001	ROBERT WHALEN HOMES	108
LA006010	BOOKER T WASHINGTON	151	NY009004	LINCOLN PARK HOMES	271
LA006013	MCKEEN PLAZA I	100			
MA001	LOWELL HOUSING AUTHORITY		OH001	COLUMBUS METROPOLITAN HOUSING AUTHORITY	
MA001001	NORTH COMMON VILLAGE	538	OH001001	POINDEXTER VILLAGE	406
MA001011	FRANCIS GATEHOUSE MILL	90	OH001014	WORLEY TERRACE	226
			OH001043	THORNWOOD COMMONS	86
MA003	CAMBRIDGE HOUSING AUTHORITY		OH005	DAYTON METROPOLITAN HOUSING AUTHORITY	
MA003001	WASHINGTON ELMS	175	OH005001	PARKSIDE HOMES	560
MA003005	NEWTOWNE COURT	268	OH005005	DESOTO BASS COURTS	200
MA003006	HARRY S TRUMAN APTS	67	OH005017	WILMINGTON PIKE (ELDERLY)	90
MA012	WORCESTER HOUSING AUTHORITY		OH006	LUCAS METROPOLITAN HOUSING AUTHORITY	
MA012005	PLEASANT TOWER APT	133	OH006001	CHARLES F WEILER HOMES	378
MA012008	LINCOLN PARK TOWER APT	199	OH006030	TENEYCK TOWERS	153
			OH006037	LUCAS MHA	87
MD004	HOUSING OPPRTY COM OF MONTGOMERY CO		OH007	AKRON METROPOLITAN HOUSING AUTHORITY	
MD004002	ELIZABETH HOUSE	160	OH007005	BELCHER APARTMENTS	155
			OH007028	SUMMIT LAKE	239
MI001	DETROIT HOUSING COMMISSION		OH008	TRUMBULL METROPOLITAN HOUSING AUTHORITY	
MI001008	FREDERICK DOUGLASS	688	OH008001	TRUMBULL HOMES	224

Exhibit A-9: Final Sample of Housing Authorities and Developments (continued)

OH008002	HIGHLAND TERRACE	200	TN003	KNOXVILLE COMMUNITY DEVEL CORP	
OH008006	MCKINLEY TOWERS	105	TN003008	WALTER P. TAYLOR HOMES	227
			TN003010	CAGLE TERRACE	271
OK002	HOUSING AUTHORITY OF THE CITY OF OKLAHOMA CITY		TN003014	FRANK MONTGOMERY VILLAGE	360
OK002012	AMBASSADOR COURTS	200	TN004	CHATTANOOGA HOUSING AUTHORITY	
OK002014	FRED FACTORY GARDENS	74	TN004002	EAST LAKE COURTS	433
			TN004005	MAURICE POSS HOMES	192
OK073	HOUSING AUTHORITY OF THE CITY OF TULSA		TN004008	EMMA WHEELER HOMES	340
OK073010	SANDY PARK	160			
OK073012	PARKVIEW TERRACE	225	TX001	AUSTIN HOUSING AUTHORITY	
OK073017	SOUTH HAVEN MANOR	100	TX001004	MEADOWBROOK COURTS	160
			TX001015	NORTH LOOP APARTMENTS	130
OR002	HOUSING AUTHORITY OF PORTLAND		TX001016	NORTHGATE WEST APARTMENTS	50
OR002001	COLUMBIA VILLA	478			
OR002017	SCHRUNK RIVERVIEW	118	TX005	HOUSING AUTHORITY OF THE CITY OF HOUSTON	
			TX005006	CLAYTON HOMES	252
PA006	ALLEGHENY COUNTY HOUSING AUTHORITY		TX005011	LINCOLN PARK	264
PA006023	PROSPECT TERRACE	89			
PA006026	PARK APTS	190	TX009	HOUSING AUTHORITY OF DALLAS	
			TX009005	FRAZIER COURTS	248
PA011	BETHLEHEM HOUSING AUTHORITY		TX009009	RHODES TERRACE	389
PA011001	PEMBROKE VILLAGE	196	TX009022	AUDELIA MANOR	122
PA011002	MARVINE VILLAGE	400			
			VA006	NORFOLK REDEVELOPMENT HOUSING AUTHORITY	
PA018	WESTMORELAND COUNTY HOUSING AUTHORITY		VA006009	TIDEWATER PRK	626
PA018009	ARNOLD MANOR	80	VA006011	CALVERT	314
PA018015	PARNASSUS MANOR	104	VA006018	ROBERT PARTREA	114
PA018023	JEANNETTE TOWNHOUSES	30			
			VA007	RICHMOND REDEVELOPMENT HOUSING AUTHORITY	
RI001	PROVIDENCE HOUSING AUTHORITY		VA007004	HILLSIDE CT	402
RI001004	HARTFORD PARK	372	VA007006	WHITCOMB CT	447
RI001006	HARTFORD PARK EXTENSION	84	VA007010	SMALL HOUSE PROGRAM	82
SC002	HOUSING AUTHORITY OF COLUMBIA		WA002	HOUSING AUTHORITY OF KING COUNTY	
SC002001	GONZALES GARDENS	280	WA002004	PARK LAKE HOMES I	572
SC002004	SAXON HOMES	400	WA002020	SOUTHRIDGE HOUSE	80
SC002010	MARION STREET HIGHRISE	146	WA002026	BURNDAL HOMES	50
SC003	HOUSING AUTHORITY OF SPARTANBURG		WA005	HOUSING AUTHORITY CITY OF TACOMA	
SC003005	PHYLLIS GOINS COURTS	180	WA005004	SALISHAN	238
SC003007	CAMMIE CLAGETT COURTS	150	WA005010	602 WRIGHT	48

Developments in Certainty Sites from Housing Authorities with 4,546 to 6,600 Units

AL001	HOUSING AUTHORITY OF THE BIRMINGHAM DISTRICT		TN001	MEMPHIS HOUSING AUTHORITY	
AL001003	METROPOLITAN GARDENS	910	TN001001	LAMAR TERRACE	427
AL001004	SOUTHTOWN	456	TN001005	DIXIE HOMES	68
AL001007	JOSEPH H LOVEMAN VILLAGE	500	TN001007	OATES MANOR	280
AL001009	SMITHFIELD COURT	464	TN001012	FOWLER HOMES	320
AL001018	RALPH KIMBROUGH HOMES	231			
			TN005	METROPOLITAN DEVELOPMENT HOUSING AGENCY	
CA001	SAN FRANCISCO HOUSING AUTHORITY		TN005007	SAM LEVY HOMES	478
CA001002	POTRERO TERRACE	469	TN005008	PRESTON TAYLOR HOMES	544
CA001015	PING YUEN	234	TN005012	ANDREW JACKSON COURTS	398
CA001016	ALEMANY	156	TN005014	I.W. GERNERT HOMES	181
KY001	HOUSING AUTHORITY LOUISVILLE		TX003	HOUSING AUTHORITY OF EL PASO	
KY001001	CLARKSDALE	721	TX003008	CHELSEA PLAZA	330
KY001004	SHEPPARD SQUARE	327	TX003014	JOHN D. CRAMER MEMORIAL	144
KY001005	IROQUOIS HOMES	853	TX003023	DWIGHT D. EISENHOWER APTS	260
KY001018	LOURDES HALL	62	TX003032	HARRY S. TRUMAN APTS	90
MN002	MINNEAPOLIS PHA IN AND FOR THE CITY OF MINEAPOLIS		TX006	SAN ANTONIO HOUSING AUTHORITY	
MN002009	HIAWATHA APARTMENTS	281	TX006004	WHEATLEY COURTS	232
MN002016	PARK CENTER	180	TX006035	VILLAGE EAST/OLIVE PARK	50
MN002026	FRIENDSHIP MANOR	84	TX006042	W.C. WHITE	75
MN002031	CHARLES HORN TOWERS	491			
MN002037	HAMILTON MANOR	220	WA001	SEATTLE HOUSING AUTHORITY	
			WA001008	HIGH POINT	723
MO001	ST. LOUIS HOUSING AUTHORITY		WA001012	CAL-MOR CIRCLE	74
MO001001	CARR SQUARE VILLAGE	182	WA001017	DENNY TERRACE	222
MO001002	CLINTON PEABODY	566	WA001033	BEACON TOWERS	108
MO001017	WEST PINE APARTMENTS	127			

Exhibit A-9: Final Sample of Housing Authorities and Developments (continued)

Developments in Certainty Sites from Housing Authorities with More than 6,600 Units

CA004 HOUSING AUTHORITY OF THE CITY OF LOS ANGELES				MD002 HOUSING AUTHORITY OF BALTIMORE CITY			
CA004001	RAMONA GARDENS	498		MD002001	LATROBE HOMES	701	
CA004003	PUEBLO DEL RIO	390		MD002003	PERKINS HOMES	688	
CA004005	ALISO VILLAGE	684		MD002004	POE HOMES	298	
CA004013	NICKERSON GARDENS	1056		MD002011	CHERRY HILL HOMES	600	
CA004020	ESTRADA COURTS EXTENSION	200		MD002022	WESTPORT HOMES	200	
CA004022	SAN FERNANDO GARDENS	448		MD002025	THE BROADWAY	99	
CA004027	DANA APTS/SEC 23/TKY III	10		MD002031	ROSEMONT/DUKELAND	136	
				MD002039	CLAREMONT HOMES EXT	152	
DC001 D.C. HOUSING AUTHORITY				NJ002 NEWARK HOUSING AUTHORITY			
DC001009	BARRY FARMS DWELLINGS	427		NJ002005	BAXTER TERR	477	
DC001018	EAST CAPITOL DWELLINGS	577		NJ002008	FELIX FULD	287	
DC001019	KENILWORTH COURTS	415		NJ002015	ETELLA WRIGHT	1136	
DC001043	POTOMAC GARDENS	350		NJ002021	KRETCHMER-BOYDEN	1000	
DC001064	FORT LINCOLN	119		NJ002022	BAXTER-CRANE	1000	
DC001065	JUDICIARY HOUSE	271		NJ002027	NEWARK HOUSING AUTHORITY	104	
FL005 MIAMI-DADE HOUSING AUTHORITY				NY005 NEW YORK CITY HOUSING AUTHORITY			
FL005004	JAMES E SCOTT HOMES	754		NY005001	RED HOOK I (EAST)	1824	
FL005012	JOE MORETTI APTS	288		NY005002	QUEENSBRIDGE	1517	
FL005015	ANNIE COLEMAN	144		NY005005	EAST RIVER	1158	
FL005025	CLAUDE PEPPER TOWERS	166		NY005007	CLASON POINT GARDENS	386	
FL005026	HALEY SOFGE TOWERS	475		NY005008	JACOB RIIS	1187	
FL005032	RAINBOW VILLAGE	100		NY005010	ST NICHOLAS	1508	
FL005069	MOODY VILLAGE	64		NY005011	BREUKELN	1595	
FL005081	MOODY GARDENS	34		NY005012	BARUCH	2193	
GA006 HOUSING AUTHORITY OF THE CITY OF ATLANTA GEORGIA				NY005019	EDENWALD	2039	
GA006010	UNIVERSITY HOMES	500		NY005021	LA GUARDIA	1098	
GA006012	BOWEN HOMES	650		NY005024	SEN. ROBERT F. WAGNER SR.	2162	
GA006014	PALMER HOUSE	249		NY005027	HAMMEL	712	
GA006028	BANKHEAD COURTS	392		NY005029	RED HOOK II	348	
GA006048	3601 PIEDMONT ROAD	208		NY005030	GENERAL GRANT	1940	
GA006053	HIGHTOWER MANOR	129		NY005034	SAMUEL J. TILDEN	1047	
IL002 CHICAGO HOUSING AUTHORITY				NY005035	LOUIS HEATON PINK	1500	
IL002001	IDA B WELLS HOMES	1662		NY005036	JAMES MONROE	1102	
IL002003	ROBERT H. BROOKS HOMES	230		NY005039	RICHMOND TERRACE	488	
IL002007	ALTGELD GARDENS	1500		NY005040	WEST BRIGHTON I II	634	
IL002009	DEARBORN HOMES	792		NY005041	WILLIAMSBURG	1620	
IL002011	PHILIP MURRAY HOMES	500		NY005047	LAFAYETTE	890	
IL002017	GRACE ABBOTT HOMES	766		NY005053	ROBERT FULTON	944	
IL002018	IDA B. WELLS EXTENSION	384		NY005054	ELEANOR ROOSEVELT I	763	
IL002022	STATEWAY GARDENS	1189		NY005062	POLO GROUNDS TOWERS	1614	
IL002024	JULIA LATHROP	923		NY005067	33-35 SARATOGA AVE	125	
IL002025	TRUMBULL PARK HOMES	409		NY005074	WYCKOFF GARDENS	529	
IL002030	WILLIAM GREEN HOMES	924		NY005095	2440 BOSTON ROAD PLAZA	235	
IL002032	43RD PRINCETON HOMES	399		NY005114	SHEEPSHEAD BAY	1056	
IL002034	WASHINGTON PARK	1401		NY005116	LOUIS ARMSTRONG II	257	
IL002043	MIDWEST TERRACE APTS	129		NY005123	CONEY ISLAND I SITES 45	374	
IL002045	CALLNER APARTMENTS	151		NY005181	JACOB RIIS	578	
IL002046	RAYMOND HILLIARD CENTER	704		NY005183	DYCKMAN	1167	
IL002048	BRITTON BUDD APTS	172		NY005184	RAVENSWOOD	2165	
IL002063	LINCOLN PERRY APTS	267		NY005189	ATLANTIC TERMINAL URA	300	
IL002066	3920-40 N CLARK APTS	194		NY005190	MORRISANIA AIR RIGHTS URA	843	
IL002071	1845 N LARRABEE APTS	86		NY005216	REDFERN	604	
IL002072	2720 N SHEFFIELD APTS	206		NY005217	DR. BETANCES VI	155	
LA001 HOUSING AUTHORITY OF NEW ORLEANS				NY005249	BOYNTON AVE REHAB	82	
LA001002	C. J. PEETE	723		NY005259	LOWER EAST SIDE INFILL	192	
LA001005	LAFITTE	896		NY005267	GLENMORE PLAZA	438	
LA001008	SAINT BERNARD	706		NY005213	BROWNSVILLE	1338	
LA001010	C. J. PEETE EXTENSION	542		NY005220	BRONX RIVER	1467	
LA001012	B. W. COOPER EXTENSION	812		NY005220	CYPRESS HILLS	1441	
MA002 BOSTON HOUSING AUTHORITY				NY005220	FARRAGUT	1390	
MA002001	CHARLESTOWN	1133		NY005213	INGERSOLL	1796	
MA002009	FRANKLIN HILL	365		NY005213	KING TOWERS	1375	
MA002019	BROMLEY PARK	566		NY005213	LINCOLN	1283	
MA002024	OLD COLONY	867		NY005213	MARCY	1705	
MA002026	MARY COLLINS	44		NY005220	SOUNDVIEW	1258	
MA002047	GENERAL WARREN	94		NY005213	WALD	1821	
MA002058	WEST NEWTON ST	134		OH003 CUYAHOGA METROPOLITAN HOUSING AUTHORITY			
MA002071	PATRICIA WHITE	222		OH003008	RIVERSIDE PARK APTS	409	
MA002089	FRANKLIN FIELD 1/5	338		OH003013	GARDEN VALLEY	358	
				OH003021	WADE APARTMENTS	224	

Exhibit A-9: Final Sample of Housing Authorities and Developments *(continued)*

OH003035	BEACHCREST APTS	231	RQ003033	JOSE GAUTIER BENITEZ	492
OH003041	MILES ELMARGE	134	RQ003035	VISTA ALEGRE	74
OH004	CINCINNATI METROPOLITAN HOUSING AUTHORITY		RQ003038	MANUEL R ADAMES	64
OH004002	ENGLISH WOODS	750	RQ003046	AGUSTIN RUIZ MIRANDA	80
OH004004	LINCOLN COURT	921	RQ003081	EXT. MANUEL A. PEREZ	900
OH004010	FINDLATER GARDENS ADD.	292	RQ003089	VILLA DEL PARQUE	100
OH004017	STANLEY ROWE TOWERS	428	RQ003091	EL RECREO	300
OH004021	THE PRESIDENT	100	RQ003100	DR AGUSTIN STAHL	400
OH004040	SCATTERED SITES EAST WEST	218	RQ004003	FRANKLIN D ROOSEVELT	599
PA001	HOUSING AUTHORITY, CITY OF PITTSBURGH		RQ004009	MANUEL HERNANDEZ ROSA	268
PA001002	BEDFORD DWELLINGS	420	RQ005004	RAUL CASTELLON	200
PA001009	NORTHVIEW HEIGHTS	731	RQ005010	BRISAS DEL TURABO	178
PA001012	GARFIELD HEIGHTS	632	RQ005015	CONDOMINIO GLADIOLAS I	295
PA001013	ADDISON ADDITION	194	RQ005020	DR PEDRO J PALOU	160
PA001031	MURRAY TOWERS	69	RQ005022	LA CEIBA	300
PA002	PHILADELPHIA HOUSING AUTHORITY		RQ005031	JARDINES DE CAMPO RICO	196
PA002001	JAMES W JONHSON HOMES	530	RQ005033	EL TREBOL	152
PA002002	TASKER HOMES	962	RQ005034	ALTURAS DE CUPEY	250
PA002030	ABBOTTSFORD HOMES	562	RQ005035	VILLA ESPERANZA	300
PA002031	BARTRAM VILLAGE	493	RQ005038	LAS MARGARITAS	231
PA002039	WESTPARK APARTMENTS	325	RQ005039	JARD. DE MONTE HATILLO	698
PA002049	MORTON HOMES II	117	RQ005048	CARIOCA	200
PA002061	PASCHALL APARTMENTS	219	RQ005080	JARDINES DE CUPEY	308
RQ005	PUERTO RICO PUBLIC HOUSING ADMINISTRATION		RQ005088	LIRIOS DEL SUR	320
RQ001002	SANTIAGO IGLESIAS, PONCE	280	RQ005103	TORRES DE SABANA	451
RQ001008	DR PILA IGLESIAS, PONCE	586	RQ005104	LOS MURALES	213
RQ001015	EXT MANUEL DE LA PILA	120	RQ005105	LAS VIOLETAS	88
RQ002009	LUIS LLORENS TORRES	2570	RQ005111	JARDINES DE CONCORDIA	200
RQ002010	VISTA HERMOSA	894	RQ005114	COVADONGA	504
RQ002011	ERNESTO RAMOS ANTONINI	864	RQ005151	SIERRA LINDA	200
RQ002014	LAS MARGARITAS	344	RQ005160	LAS DELICIAS	100
RQ003017	VIRGILIO DAVILA	448	RQ005168	LOS LAURELES	100
RQ003019	JUAN JIMENEZ GARCIA	256	RQ005171	PONCE HOUSING	131
RQ003027	SANTA RITA DE CASIA	156	RQ005214	BELLA VISTA HEIGHTS	100
			RQ005250	MAYAGUEZ PUBLIC HOUSING	48

Exhibit A-10: Description of Initial and Post-Inspection Sampling Universe and Combined Final Sample

	Initial Sampling Universe		Post-Inspection Sampling Universe		Final Sample	
	Number	Percent	Number	Percent	Number	Percent
<i>Units by Region</i>						
Northeast	431,634	36.7	417,289	36.8	211	30.8
South	439,982	37.4	424,003	37.4	285	41.7
Rest	303,697	25.8	292,673	25.8	188	27.5
Total	1,175,312 ^a	100.0	1,133,965 ^a	100.0	684	100.0
<i>Units by Development Average Bedroom Size</i>						
1.5 BRs or less	331,822	28.2	301,500	26.6	183	26.8
More than 1.5 BRs	843,491	71.8	832,464	73.4	501	73.2
Total	1,175,312	100.0	1,133,965	100.0	684	100.0
<i>Units by Development Size</i>						
Less than 300 units	825,867	70.3	786,296	69.3	500	73.1
300 or more units	349,446	29.7	347,668	30.7	184	26.9
Total	1,175,312	100.0	1,133,965	100.0	684	100.0
<i>Units by Development Vacancy Rate</i>						
Vacancy rate 10% or less	983,092	83.6	961,600	84.8	517	82.9
Vacancy rate more than 10%	192,220	16.4	172,362	15.2	108	17.1
Total	1,175,312	100.0	1,133,965	100.0	684	100.0
<i>Units by Housing Authority Size</i>						
Less than 250 units	197,572	16.8	190,221	16.8	126	18.4
250-1249 units	336,191	28.6	326,631	28.8	187	27.3
1250-6600 units	289,060	24.6	273,620	24.1	177	25.9

More than 6600 units	196,058	16.7	187,059	16.5	144	21.1
New York City	156,432	13.3	156,432	13.8	50	7.3
Total	1,175,312	100.0	1,133,963	100.0	684	100.0

a Excludes Alaska, Hawaii, Guam and the U.S. Virgin Islands, and all scattered-site, HOPE VI, and Demolition developments.

VI. Adjustments to the Universe

The universe file we originally received from HUD included 1,308,050 units. We excluded several categories of developments and units from the Final Sample of Housing Authorities and Developments.

- All 77,743 units in developments with approved demolition plans, completed demolitions, or approved HOPE VI implementation grants.
- All 12,097 units in developments located outside the contiguous 48 states, the District of Columbia, and Puerto Rico (i.e., developments in Alaska, Hawaii, Guam, and the U.S. Virgin Islands).
- All 39,641 units in developments explicitly listed as scattered-site on HUD's data bases.
- All 566 units in Turnkey developments.

After these exclusions, the sampling universe consisted of 1,178,003 units. During the inspections, the inspectors identified additional units in excluded categories of properties, so that following the inspections, our revised estimate of the sampling universe was 1,133,963 units.

To provide a full picture of national needs, we made estimates for a portion of the excluded developments and units. We assumed that all scattered-site developments and developments with HOPE VI implementation grants and approved demolition plans are family developments and therefore their modernization needs are similar to the needs in other family developments in their housing authority. Thus the sample weights were adjusted as follows to account for these additional units that were not included in the original study universe, but are to be funded under the Capital Fund:

- For all developments with HOPE VI implementation grants, approved demolition plans and completed demolition, we received from HUD the number of units not included in the rehabilitation or demolition. For developments in any of the 219 housing authorities in our study sample, we increased the weight of family developments in that housing authority to account for the additional units. For any HOPE VI or demolished developments not in the sample housing authorities, we increased the weight of family developments in all sample developments within the same housing authority size category to account for the additional units.
- A similar approach was taken to adjust the weights to account for the scattered-site developments, and for the unit-acquisition units in the Maryland area. For any scattered-

site developments in the 219 housing authorities in our study sample, we increased the weight of family developments in that housing authority to account for the additional units. For any scattered-site developments not in sample housing authorities, we increased the weight of family developments in all sample developments within the same housing authority size category to account for the additional units.

Exhibit A-11 presents our final compilation of the universe, reflecting our revised results following the inspections and taking into account the additions to the universe described above.

Because we did not include Alaska, Hawaii, Guam or the U.S. Virgin Islands in our original sampling frame, we cannot make adjustments to our existing weights to account for these locations. Instead, we can add their actual number of units (12,097) to the sample-based estimate to come up with a national total estimate of 1,206,467 units to be funded by the Capital Fund.

Exhibit A-11: Final Universe

	Initial Sampling Universe		Post-Inspection Sampling Universe		Inspection Universe (Adds in Excluded Units)	
	Number	Percent	Number	Percent	Number	Percent
<i>Units by Region</i>						
Northeast	431,634	36.7	417,289	36.8	438,758	36.7
South	439,982	37.4	424,003	37.4	442,187	37.0
Rest	303,697	25.8	292,673	25.8	313,425	26.2
Total	1,175,312 ^a	100.0	1,133,965	100.0	1,194,370	100.0
<i>Units by Development Average Bedroom Size</i>						
1.5 BRs or less	331,822	28.2	301,500	26.6	301,767	25.3
More than 1.5 BRs	843,491	71.8	832,464	73.4	892,604	74.7
Total	1,175,312	100.0	1,133,965	100.0	1,194,370	100.0
<i>Units by Development Size</i>						
Less than 300 units	825,867	70.3	786,296	69.3	823,156	68.9
300 or more units	349,446	29.7	347,668	30.7	371,214	31.1
Total	1,175,312	100.0	1,133,965	100.0	1,194,370	100.0
<i>Units by Development Vacancy Rate</i>						
Vacancy rate 10% or less	983,092	83.6	961,600	84.8	994,466	83.3
Vacancy rate more than 10%	192,220	16.4	172,362	15.2	199,904	16.7
Total	1,175,312	100.0	1,133,965	100.0	1,194,370	100.0
<i>Units by Housing Authority Size</i>						
Less than 250 units	197,572	16.8	190,221	16.8	197,525	16.5
250-1249 units	336,191	28.6	326,631	28.8	342,347	28.7
1250-6600 units	289,060	24.6	273,620	24.1	291,365	24.4

More than 6600 units	196,058	16.7	187,059	16.5	206,701	17.3
New York City	156,432	13.3	156,432	13.8	156,432	13.1
Total	1,175,312	100.0	1,133,963	100.0	1,194,370	100.0

^a Excludes Alaska, Hawaii, Guam and the U.S. Virgin Islands.

Appendix B: Data Collection

This appendix describes the data collection methods used for the Formula Capital Study. Our analysis is based on data collected from three main sources:

- on-site physical inspections of public housing buildings and units to estimate capital needs (the sampling strategy is described in Appendix A; the method by which we assigned costs to the inspection data is described in Appendix C);
- modernization funding and other background data collected directly from public housing authorities; and
- secondary sources of data containing various housing authority-level and development-level characteristics from several HUD databases.

Data collection methods for each of these types of data are described below.

I. Physical Inspections

As soon as the sample was approved by HUD, Abt Associates Inc. and HUD notified sampled housing authority directors and modernization coordinators of the requirements for this study. Exhibit B-1 contains the letters from HUD and Abt Associates Inc. notifying the housing authorities of this study. The physical condition of the public housing stock was assessed on-site by architects and engineers from the DLR Group, a national architectural and engineering firm based in Omaha, Nebraska. The purpose of the on-site physical inspections was to obtain current information on the physical condition of public housing at a level of detail sufficient to indicate the nature of physical deficiencies and the costs that would be required to remedy immediate repair needs and address existing modernization needs, as well as to estimate the ongoing accrual of physical needs over the next 20 years.

Observable Systems Method. The immediate repair needs and existing modernization needs were estimated using the Observable Systems Approach, which was initially developed by Abt Associates

Inc. for the 1985 Modernization Needs Study of Public Housing and refined for several additional studies.¹ Under this method, the condition of each property's systems

¹ Dixon Bain et al., *Study of the Modernization Needs of the Public and Indian Housing Stock* (Cambridge, MA: Abt Associates Inc., March 1988); James Wallace et al., *Current Status of HUD-Insured (or Held) Multifamily Rental Housing* (HUD, PD&R 1993); Judie Feins et al., *Viability Review for Physical Improvements for the San Francisco Housing Authority* (Cambridge, MA: Abt Associates Inc., September 1991); Meryl Finkel et al., *Status of HUD-Insured (or Held) Multifamily Rental Housing in 1995* (Cambridge, MA: Abt Associates Inc., December 1998). Details on the precise protocols and forms used for the current study are provided in the HUD Formula Capital Study *Inspector's Manual*, (Abt Associates Inc., January 1998).

Exhibit B-1: Letters from HUD and Abt Associates Inc. to Housing Authorities

B-1 cont.

is observed, evaluated, and assessed on-site (see Chapter One for more details); and then costed in a consistent manner off-site using a regionalized database of repair costs and a computerized costing program (see Appendix C for further discussion).

Five types of information were collected for each property:

- current condition—observations on 135 site-, building-, and unit-level systems that were used in the study to estimate immediate repair needs (the cost to bring all systems up to working condition);
- upgrade feasibility—determination of whether a property could be physically upgraded to ensure decent and sustainable housing with modest amenities by replacing or adding to selected systems, for use in estimating existing modernization needs;
- property characteristics and takeoffs—an inventory of all building and unit types and conditions, average sizes of units, typical building dimensions, and the dimensions of certain systems, used by the study both in costing immediate repair and existing modernization needs and estimating future accruals of repair and replacement costs;
- neighborhood characteristics—a windshield survey and a summary observation form were used to describe the attributes of the development and the surrounding neighborhood; and
- housing quality (HQ) questions—a checklist of items that helps to identify developments in substandard condition.

Our assessment of physical needs excluded three categories of expenditures that many public housing authorities will be required to comply with:

- Modifications for accessibility for the disabled, as required by Section 504 of the Rehabilitation Act of 1973, as amended;
- Measures taken solely to mitigate hazards of lead paint or asbestos; and
- Improvements for increasing energy efficiency.

The only exception to this is that the replacement of a heating system or appliance, for example, assumes installing a standard quality replacement according to current practice, and not simply replacing the old system.

Inspection Protocol. The inspection protocol included observing conditions of 135 mechanical, electrical, and architectural systems. See Appendix C for a list of these systems. For each system, the

inspector judged and recorded the level of remedial action needed to restore the system to its original condition. The action levels were “No Action,” “Minor Action,” “Moderate Action,” “Major Action,” and “Replace,” based on the observed condition. Minor defects that could be corrected through routine maintenance (e.g., faucet washer replacement) were excluded.

The DLR Group inspectors used a standard set of eight inspection booklets developed by Abt Associates Inc.—Site, Building Envelope, Building Mechanical and Electrical, Central Mechanical and Electrical, Unit, Takeoffs, Stock Inventory Quality Distribution, Central Facilities—to collect all relevant system-level information. For each observable system, the inspector noted presence or absence of the system; age; type, if appropriate (e.g., battery or hard-wired smoke detectors); number, if appropriate (e.g., the number of windows); and the repair action level associated with the observed condition.

A detailed Inspection Manual was developed to describe each system and the repair actions pertaining to each system, as well as to document the inspection protocol. For each system, the manual defines the system, explains where and how to observe the system, and then describes the repair needs associated with each action level. The manual also describes the process to follow in determining upgrade feasibility for selected systems. This process will be described in detail at the end of this appendix. The manual gives an overview of the study, and describes the procedures to use to prepare for the inspection, including selecting which buildings and units to inspect. Finally, the manual covers the process of recording the inspection data accurately, procedures to follow in reviewing the data, and where to get help.

The action levels assigned to each observable condition were provided to all inspectors during a week-long training session in Atlanta which included both classroom training and hands-on training. The classroom training included a complete review of the systems and the different levels of repair action, as well as the proper protocol to follow during the inspections. The hands-on training involved teams of inspectors going on-site to several of Atlanta's public housing developments to actually conduct the inspection under the guidance of a senior inspector experienced in the Observable Systems methodology.

The comprehensive training and uniform set of instructions helped to assure consistency across individual inspectors. Exhibits B-2 and B-3 are samples of an inspection booklet and the corresponding action level description from the Inspection Manual. The examples are taken from the “Full Bathroom” section of the “Unit” booklet. (Exhibit B-2 is a page from that booklet.) Under the section labeled “Full Bathrooms” are the seven systems observed in the bathroom inspection. Some systems (walls and ceilings, accessories) require only an action level in order to estimate repair cost; others require a type (e.g., the materials in use, or size), as well as an action level for the repair estimate. For example, under the Bathroom Floor Cover and Sub-base System, “Type” is necessary because replacing a *ceramic* tile floor would be more costly than replacing a *resilient* tile floor or linoleum. Exhibit B-3 is

taken from the Inspection Manual of conditions and action levels.

Using architectural drawings, when available, or “pacing off” when no plans were available, the inspectors calculated takeoff measurements for site areas and distribution systems, average unit square footage for all unit sizes present at the property, and key building dimensions for up to three predominant types/sizes of buildings. These measurements were recorded in the Takeoff booklet.

The Property Quality Distribution contained within the Stock Inventory Quality Distribution form was used to obtain overall descriptions of the development stock and the relative quality of units and buildings at the development. This form was also used to guide the selection of buildings and units to inspect, which is described below.

In advance of the inspector's visit, the DLR Group sent a Property Quality Distribution form to the property manager. The manager completed the information on the number of units by size (bedrooms and bathrooms) and condition, as well as the number of buildings by type (high-rise, walk-up, garden/townhouse, single-family detached) and condition. A definition guide on conditions (excellent, good, fair and poor) was attached to the form to make it easier for the manager to categorize the units and buildings. When the inspectors arrived on-site, they reviewed the Property Quality Distribution form with the property manager and discussed the general characteristics of the property, including:

- Number, type (high-rise, walk-up, etc.), and age of buildings,¹
- Number of units by bedroom and bathroom size,⁴ and
- The property manager’s assessment of the overall condition of buildings and units (i.e., what proportion the manager estimated were in excellent, good, fair, or poor condition.).²

1 The inspector recorded this information on the Stock Inventory and Quality Distribution form.

2 Initially the property manager recorded this information on the Property Quality Distribution form, and then after confirmation, the inspector transferred this information to the Stock Inventory and Quality Distribution form.

Exhibit B-2: Example of Inspection Booklet

UNIT		21	{LABEL}					Unit Name/Address _____			
								# Bedrooms: _____			
								Unit Quality: E G F P			
ID	UNIT SYSTEM	AB (✓)	TYPE	#	ACTIONS					AGE	COMMENTS / HOUSING QUALITY QUESTIONS
					NO ACT	MIN	MOD	MAJ	REP		
INTERIOR (excluding kitchens & baths)											
201	WALLS & CEILINGS: PARTITIONS									%	WALLS / CEILINGS: EVIDENCE OF SIGNIFICANT LEAKS? <input type="checkbox"/> YES <input type="checkbox"/> NO LARGE CRACKS? <input type="checkbox"/> YES <input type="checkbox"/> NO PEELING PAINT OR PLASTER MORE THAN 1 FT. SQUARE? <input type="checkbox"/> YES <input type="checkbox"/> NO
202	SURFACES										
203	FLOOR SUB-BASE									%	
204	FLOOR COVERING: CARPET									%	
	RESILIENT									%	
205	INTERIOR DOORS & FRAMES						#	#	#		
KITCHEN											
206	WALLS AND CEILINGS									%	
207	FLOOR SUB-BASE & COVERING										
208	CABINETS/COUNTERS/SINK										
209	RANGE ONLY										
	RANGE AND HOOD										
210	REFRIGERATOR										
FULL BATH Number: _____											
211	WALLS AND CEILINGS									%	SIGNIFICANT LEAKS? <input type="checkbox"/> YES <input type="checkbox"/> NO LARGE CRACKS? <input type="checkbox"/> YES <input type="checkbox"/> NO PEELING PAINT/PLASTER? <input type="checkbox"/> YES <input type="checkbox"/> NO
212	FLOOR SUB-BASE & COVERING										
213	FIXTURES: SINK										
	TOILET										FLUSH PROPERLY? <input type="checkbox"/> YES <input type="checkbox"/> NO
	TUB/SHOWER										
214	ACCESSORIES										
215	VANITIES										
HALF BATH Number: _____											

ID	UNIT SYSTEM	AB (✓)	TYPE	#	ACTIONS					AGE	COMMENTS / HOUSING QUALITY QUESTIONS
					NO ACT	MIN	MOD	MAJ	REP		
211	WALLS AND CEILINGS								%		SIGNIFICANT LEAKS? <input type="checkbox"/> YES <input type="checkbox"/> NO LARGE CRACKS? <input type="checkbox"/> YES <input type="checkbox"/> NO PEELING PAINT/PLASTER? <input type="checkbox"/> YES <input type="checkbox"/> NO
212	FLOOR SUB-BASE & COVERING										
213	FIXTURES: SINK										
	TOILET										
214	ACCESSORIES										FLUSH PROPERLY? <input type="checkbox"/> YES <input type="checkbox"/> NO
215	VANITIES										

Exhibit B-3: Example from Inspector Manual

Inspection Manual: *HUD Formula Capital Study*

211. Bathroom Wall and Ceilings—Partitions and Surfaces

Common Elements: Items common to the bathroom walls and ceilings include wall structures, ceiling structures, paint, wallpaper, rubber or wood base, and tile.

Where to Observe: The walls and ceilings located in the inspected unit bathrooms should be observed.

Inspection Method:

- ☐ Walk around the bathroom in the inspected unit and observe the condition of the walls and ceilings. If the unit has multiple full or half bathrooms, inspect the first full and half bathroom encountered. Quickly determine if the other bathrooms are similar. If not, note the differences on the form.
- ☐ Record the percentage of the walls and ceilings that need to be replaced.

Special Note: Include the tile around the tub or shower in this system.

Definition of Action Levels:

Minor Action: The surface is intact but exhibits minor aging or deterioration and needs to be painted.

Moderate Action: The surface has occasional damage requiring surface patching and painting.

Major Action: The surface has incurred considerable damage, requiring surface material restoration, including tile replacement and paint.

Replace: The surface and framing system need to be replaced and painted. *Record the percentage of the walls and ceilings that need to be replaced.*

212. Bathroom Floor Sub-base and Covering

Definition: The floor sub-base refers to a rough floor, laid on joists, which serves as a base for the finished floor. The floor covering could consist of tile, sheetgood, or carpet. There are two types of floor covering:

- ☐ Ceramic tile
- ☐ Resilient sheetgoods

Where to Observe: The floor located in the inspected unit bathrooms should be observed.

Inspection Method:

- ☐ Record whether the floor covering is ceramic or resilient.
- ☐ Record the age of the floor.
- ☐ The actual floor sub-base cannot be observed directly, but the inspector can note if the floor is warped or buckled.

Definition of Action Levels:

Minor Action: Not applicable.

Moderate Action: Not applicable.

Major Action: The floor covering is severely deteriorated and needs to be replaced.

Replace: The floor is buckling, warped, or splintered, requiring the replacement of the floor covering and sub-base.

213. Bathroom Fixtures

Definition: Bathroom fixtures include the sink, toilet and tub. There are two types of fixtures for a

tub/shower (full bath):

- ☐ Ceramic/porcelain
- ☐ Fiberglass

Common Elements: Items include the sink, toilet, tub and fittings.

Where to Observe: These fixtures can be observed in the bathroom.

Inspection Method:

- ☐ Each fixture is rated separately.
- ☐ Record the age of the fixtures.
- ☐ Record whether the tub/shower is ceramic or fiberglass (ceramic includes tile and/or enamel on cast iron).

Exhibit B-3 (continued)

Inspection Manual: HUD Formula Capital Study

213. Bathroom Fixtures

Definition of Action Levels:

	Sink:
Minor Action:	The fittings need to be repaired or replaced.
Moderate Action:	Not applicable.
Major Action:	Not applicable.
Replace:	The sink needs to be replaced.
	Toilet:
Minor Action:	The fittings need to be repaired or replaced.
Moderate Action:	Not applicable.
Major Action:	Not applicable.
Replace:	The toilet needs to be replaced.
	Tub/Shower:
Minor Action:	The fittings need to be repaired or replaced.
Moderate Action:	Not applicable.
Major Action:	Not applicable.
Replace:	The tub/shower needs to be replaced.

214. Bathroom Accessories

Common Elements:	Common bathroom accessories include a medicine cabinet, towel bar, shower rod, and a wall-attached soap dish.
Where to Observe:	These items can be observed in the bathroom.
Inspection Method:	<input type="checkbox"/> Record the age of the bathroom accessories. <input type="checkbox"/> Observe the condition of these items directly. <input type="checkbox"/> Ask the residents if the accessories are stable and operate properly.

Definition of Action Levels:

Minor Action:	Not applicable.
Moderate Action:	Two to three accessories are broken or missing and need to be replaced (excluding the medicine cabinet).
Major Action:	Replace medicine cabinet only.
Replace:	A majority of the accessories and the medicine cabinet are broken or missing and need to be replaced.

215. Vanities

Definition:	This item refers to the vanity structure itself and not to the sink. There are two types of vanities: <input type="checkbox"/> Two feet <input type="checkbox"/> Three feet
Where to Observe:	The vanity can be observed in the bathroom.
Inspection Method:	<input type="checkbox"/> Record whether the vanity in the inspected unit is two feet or three feet wide. <input type="checkbox"/> Record the age of the vanity. <input type="checkbox"/> Observe the structure of the vanity by opening and closing the vanity doors; observe the condition of the vanity directly.

Definition of Action Levels:

Minor Action: Not applicable.

Moderate Action: Not applicable.

Major Action: Not applicable.

Replace: The vanity is beyond repair and needs to be replaced.

Unit Booklet

January 1998

Building and Unit Sampling Procedures. From the composite of the property described on the Project Quality Distribution form, inspectors selected up to three buildings and three units to inspect, based on predominant quality categories, and predominant building types and unit types. For buildings, inspectors were instructed to always inspect a high-rise if one was present, then to inspect worse quality buildings, while including as many building types as possible. If multiple quality buildings were present, inspectors were instructed to select buildings in the worst condition first. For example, if the property had one high-rise building and twenty townhouse buildings (representing all four quality categories), the inspector would inspect the high-rise and two townhouse buildings (one in poor condition and one in fair condition).

For units, inspectors were instructed to inspect units from predominant sizes with the provision that they select units that, in the manager's opinion, were in the worst physical condition.¹ If all units at the property were in good condition, then the inspector made the selection based solely on predominant unit size. If, however, there were units ranging in quality from poor to excellent, the inspector would select poor, fair, and good units and not inspect units in excellent condition. This protocol was followed to obtain direct observations of elements most costly to repair. Adjustments to property-level repair costs for the relatively less expensive repairs of better quality units are described in Appendix C.

Upgrade Feasibility. For some systems, in addition to identifying immediate repair needs for that system, a determination was made about whether the system needed any additions or upgrades in order to ensure that the housing was decent and sustainable. Two tools were used to help the inspector make this determination. The first was direct observations and discussions with the property escort about the various systems. (Housing authorities were instructed to provide an escort who was familiar with the property's systems.) The second tool was the Summary Project Observations and Windshield Survey (SPOWS) form. This form was used to record general descriptions of the development and the surrounding neighborhood, allowing the inspector to place the inspected property in context within its neighborhood. To complete the Windshield Survey component of the SPOWS, the inspector was to spend approximately 15 minutes driving around the neighborhood and making necessary observations. Inspectors were instructed to pay particular attention to the characteristics of other low-income housing in the neighborhood.

With this information in hand, the inspector was then asked to assess the feasibility of upgrading or adding selected systems. Four of the inspection booklets (Building Envelope, Building Mechanical and

¹ The value to the study of the manager's rating of units and buildings by overall condition depended primarily on the manager's *consistency*, rather than on the manager's use of the exact definition of excellent, good, fair and poor. The inspector conducted quick "walk-throughs" of units in the various categories, in addition to conducting the actual inspections, to verify the consistency of the manager's ratings. If discrepancies existed, the inspector adjusted the distribution to reflect the differences.

Electrical, Unit and Site), the inspector was to determine whether by some investment beyond routine repairs, a property or system should be upgraded to be more comparable to other housing in the neighborhood. These determinations were based on direct observations of the system (age, technology, evidence of repair problems, etc.), discussions with the property escort about the various systems, and the observations made while completing the SPOWS. Examples of systems that could be upgraded or added include: windows, stairways, common rooms, laundry rooms, air conditioning, site parking, site lighting, landscaping, fencing and playgrounds. Unit upgrade determinations were slightly different as they were based on broad assessments of three living areas (kitchen, bathrooms, unit interior) instead of individual system-level judgements. All upgrade determinations involved a series of questions asking first whether the upgrade was necessary and second whether the upgrade was feasible. Although reconfiguration and major redesign were excluded, some of the proposed upgrades yielded significant costs per unit—for example, kitchens with major rehab needs were costed at \$15,000 per unit upgrade (prior to inter-area cost adjustment).

Depending on the system assessed, the inspector determined the upgrade action recommended:

- current system does not need to be changed;
- current system must be upgraded but not expanded (for example, the windows need to be upgraded using better more energy efficient materials, but the number of windows in the property remains unchanged);
- current system must be upgraded and expanded (for example, the site furniture needs to be upgraded using better materials, such as replacing a wooden bench with a molded, concrete bench, as well as adding more of these benches to the property);
- current system does not need to be upgraded, but should be expanded (for example, the dumpsters and enclosures do not need to be upgraded using better materials, but the number of dumpsters and enclosures available for the property needs to be increased); or,
- system is not present and should be added (for example, there are no playgrounds or tot lots on the property, but one needs to be added).

This information was recorded in the inspection booklets, as shown in the example in Exhibit B-4 under the section titled “Upgrade Feasibility for this Building.” Exhibit B-5 shows the incidence of upgrade actions by system type for the inspected sample.

Housing Quality (HQ) Questions. Inspectors were also asked to answer a short series of Housing Quality (HQ) questions, which were developed by researchers at HUD in the 1980s. These HQ questions were added to the inspection booklets and placed near the system they most closely represent. These measures of housing condition, when used with other data,

Exhibit B-4: Example of Upgrade Questions and HQ Questions

[LABEL]				Building Name/Address: _____				
---------	--	--	--	------------------------------	--	--	--	--

ID	BUILDING ENVELOPE SYSTEM	AB (✓)	TYPE	#	ACTIONS					AGE	COMMENTS / HOUSING QUALITY QUESTIONS
					NO ACT	MIN	MOD	MAJ	REP		
47	DECKS (WITHOUT ROOF)						#		#		
48	ATTACHED STORAGE SHEDS						#		#		
COMMON AREAS											
49	VESTIBULES										HALLWAYS / STAIRS: WORKING LIGHTS PRESENT? <input type="checkbox"/> YES <input type="checkbox"/> NO LOOSE / MISSING STEPS? <input type="checkbox"/> YES <input type="checkbox"/> NO LOOSE RAILINGS? <input type="checkbox"/> YES <input type="checkbox"/> NO MAJOR ROACH INFESTATION OR RAT SIGNS? <input type="checkbox"/> YES <input type="checkbox"/> NO NOXIOUS ODOR / SMELL OF URINE? <input type="checkbox"/> YES <input type="checkbox"/> NO
50	CORRIDORS									%	
51	STAIRWAYS (# flights)									%	
52	INTERIOR LIGHTING										
53	MAIL FACILITIES (# of boxes)								#		
54	LAUNDRY ROOMS										
55	LAUNDRY EQUIPMENT (# pieces)							#			
56	COMMON ROOMS										
57	COMMON KITCHENS										
58	UNDERGROUND GARAGE (# levels)										

Year of last modernization of this building: 19____ ☐ No major modernization

Office use only:
SIQD: _____
TO: _____

UPGRADE FEASIBILITY FOR THIS BUILDING

SYSTEM	Is it necessary to <u>upgrade</u> this system for mixed-income conversion? ¹	
	No/Not Present	Yes
Exterior Wall	<input type="checkbox"/> 0	<input type="checkbox"/> 1
Windows	<input type="checkbox"/> 0	<input type="checkbox"/> 1
Exterior Common Doors	<input type="checkbox"/> 0	<input type="checkbox"/> 1
Exterior Stairways	<input type="checkbox"/> 0	<input type="checkbox"/> 1
Interior Stairways	<input type="checkbox"/> 0	<input type="checkbox"/> 1
Vestibules	<input type="checkbox"/> 0	<input type="checkbox"/> 1
Corridors	<input type="checkbox"/> 0	<input type="checkbox"/> 1
Common Rooms	<input type="checkbox"/> 0	<input type="checkbox"/> 1
Common Laundry Rooms	<input type="checkbox"/> 0	<input type="checkbox"/> 1

SYSTEM	Is it necessary to <u>add</u> the system (or <u>expand</u> the current system) for mixed-income conversion? ¹		IF YES, is it practical and physically feasible to add or expand this system?		How many should be added?
	No	Yes	No	Yes	
Window Security Grates	<input type="checkbox"/> 0	<input type="checkbox"/> 1 →	<input type="checkbox"/> 0	<input type="checkbox"/> 1 →	
Storm/Screen Doors	<input type="checkbox"/> 0	<input type="checkbox"/> 1 →	<input type="checkbox"/> 0	<input type="checkbox"/> 1 →	
Building-Mounted Lights	<input type="checkbox"/> 0	<input type="checkbox"/> 1 →	<input type="checkbox"/> 0	<input type="checkbox"/> 1 →	
Canopies	<input type="checkbox"/> 0	<input type="checkbox"/> 1 →	<input type="checkbox"/> 0	<input type="checkbox"/> 1 →	
Balconies	<input type="checkbox"/> 0	<input type="checkbox"/> 1 →	<input type="checkbox"/> 0	<input type="checkbox"/> 1 →	
Porches (with roof)	<input type="checkbox"/> 0	<input type="checkbox"/> 1 →	<input type="checkbox"/> 0	<input type="checkbox"/> 1 →	
Decks (without roof)	<input type="checkbox"/> 0	<input type="checkbox"/> 1 →	<input type="checkbox"/> 0	<input type="checkbox"/> 1 →	
Attached Storage Sheds	<input type="checkbox"/> 0	<input type="checkbox"/> 1 →	<input type="checkbox"/> 0	<input type="checkbox"/> 1 →	
Common Laundry Equipment	<input type="checkbox"/> 0	<input type="checkbox"/> 1 →	<input type="checkbox"/> 0	<input type="checkbox"/> 1 →	

¹ Mixed-income refers to a mix of the current tenants (incomes less than 30% of the median) and those of modestly higher incomes (30-50% of the median).

**Exhibit B-5
Incidence of Upgrade Actions
Site Form**

System	Percentage
Upgrade Landscaping	36
Upgrade Site Parking Areas	20
Add Site Parking Areas	17
Feasible to Add Site Parking Areas	13
Upgrade Site Lighting	6
Add Site Lighting	16
Feasible to Add Site Lighting	16
Upgrade Private Yards and Enclosures	3
Add Private Yards and Enclosures	11
Feasible to Add Private Yards and Enclosures	10
Upgrade Site Furniture	18
Add Site Furniture	28
Feasible to Add Site Furniture	28
Add Playgrounds/Tot Lots	30
Feasible to Add Playground/Tot Lots	28
Add Paved Pedestrian Areas	4
Feasible to Add Paved Pedestrian Areas	4
Add Fencing	5
Feasible to Add Fencing	5
Add Retaining Walls	1
Feasible to Add Retaining Walls	1
Add Basketball Courts	16
Feasible to Add Basketball Courts	13
Add Dumpsters and Enclosures	11

Feasible to Add Dumpsters/Enclosures	10
Add Pitched Roofs	4
Feasible to Add Pitched Roofs	3

Exhibit B-5 (continued)
Incidence of Upgrade Actions
Building Envelope Form

System	Percentage
Upgrade Exterior Wall	15
Upgrade Windows	22
Upgrade Exterior Common Doors	8
Upgrade Exterior Stairways	3
Upgrade Interior Stairways	9
Upgrade Vestibules	5
Upgrade Corridors	9
Upgrade Common Rooms	2
Upgrade Common Laundry Rooms	2
Add Window Security Grates	9
Feasible to Add Window Security Grates	9
Add Storm/Screen Doors	11
Feasible to Add Storm/Screen Doors	11
Add Building Mounted Site Lights	21
Feasible to Add Building Mounted Site Lights	20
Add Canopies	3
Feasible to Add Canopies	3
Add Balconies	3
Feasible to Add Balconies	2
Add Porches	5
Feasible to Add Porches	5
Add Decks	4
Feasible to Add Decks	4
Add Sheds	10

Feasible to Add Sheds	8
Add Common Laundry Equipment	9
Feasible to Add Common Laundry Equipment	8

Exhibit B-5 (continued)
Incidence of Upgrade Actions
Building Mechanical and Electrical Form

System	Percentage
Upgrade Central Air Conditioning	0
Add Central Air Conditioning	17
Feasible to Add Air Conditioning	12
Upgrade Communication System	2
Add Communication System	6
Feasible to Add Communication System	6
Upgrade Emergency Call Alarm System	1
Add Emergency Call Alarm System	4
Feasible to Add Emergency Call Alarm System	4
Upgrade Closed Circuit Television	1
Add Closed Circuit Television	4
Feasible to Add Closed Circuit Television	4

Exhibit B-5 (continued)
Incidence of Upgrade Actions
Unit Form

Area	Percentage Needing Any Level of Upgrade
Upgrade Some Kitchen Systems ^a	33
Upgrade All Kitchen Systems ^a	5
Rehab Kitchen: Upgrade All Kitchen Systems and Move Partitions ^a	2
Upgrade Some Full Bathroom Systems ^b	30
Upgrade All Full Bathroom Systems ^b	4
Rehab Full Bathroom: Upgrade All Full Bathroom Systems and Move Partitions ^b	1
Upgrade Some Half Bathroom Systems ^b	1
Upgrade All Half Bathroom Systems ^b	0
Rehab Half Bathroom: Upgrade All Half Bathroom Systems and Move Partitions ^b	1
Upgrade Some Unit Interior Systems ^c	32
Upgrade All Unit Interior Systems ^c	4
Rehab Unit Interior: Upgrade All Unit Interior Systems and Move Partitions ^c	2

a Kitchen systems include: walls, ceiling, floor covering, cabinets, counters, sink, range, refrigerator.

b Full bath systems include: walls, ceiling, floor covering, sink, toilet, tub, vanity; half bath systems include walls, ceiling, floor covering, sink, toilet, vanity.

c Unit interior systems: include walls, ceilings, floor covering.

have helped identify and categorize substandard housing conditions. Since one of the goals of the Formula Capital Study was to help identify a short list of questions (a “checklist”) that are useful for determining, without conducting a comprehensive inspection, whether a development has severe capital needs, these questions may be useful. Also, because these are questions used elsewhere by HUD, they may be helpful in comparing the study results with other categories of properties. See Exhibit B-4 for an example of HQ questions for the “Hallways/Stairs” systems.

II. Data Collected from Housing Authorities

To obtain data on past and planned modernization spending from the housing authorities, we developed data abstraction forms for housing authority-level and development-level data (Exhibits B-6 and B-7, which appear at the end of this chapter), which were sent to all housing authorities in the study. Most of the data requested was of the type reported in the Comprehensive Grant Plans (for larger authorities) or CIAP applications (for small authorities). Wherever possible the form referred to specific elements in the Comprehensive Grant Plans (or CIAP applications), so that housing authorities could either attach the relevant part of that documentation or complete the form. Data was requested at the housing authority level as well as at the development level for the developments in our study. The data elements we requested *at the housing authority level* were:

- Number of units covered by various funding sources (e.g., federal public housing, Section 8, state assistance)
- Number of units removed from the Annual Contributions Contract (ACC)
- Special arrangements governing the housing authority (e.g., private management, HUD takeover)
- Number of units after completing the next five years of modernization
- Estimated cost of modernization, current fiscal year
- Estimated hard cost for physical needs modernization, current fiscal year
- Number of units covered by estimates of modernization spending
- Modernization funding received in 1996 and 1997, by spending categories and total
- Planned modernization spending, next four years, by spending category and total

We also requested *development-level data* for each of the developments slated to be inspected at that housing authority. The data elements requested were:

- Special arrangements governing the development (e.g., private management, HUD takeover)
- Number of units planned to be rehabbed, next five years
- Number of units planned to be demolished, next five years
- Number of units to be added, next five years
- Number of units to remain as is, next five years
- Lead-based paint/Asbestos abatement expenditures, most recent year and last three years
- Hard cost for physical needs per unit
- Modernization funding received in 1997
- Modernization funding received in four previous years (1993-96)
- Modernization funding planned for next four years

We requested information from all of the housing authorities in both the original and supplemental sample. In the original sample, this consisted of 625 developments in 199 housing authorities. We received data from 190 housing authorities, covering information on 599 developments. This represents a 95 percent response rate for housing authorities and a 96 percent response rate with regard to developments.

In the supplemental sample, we requested information on 59 developments from 20 housing authorities.¹ We received responses from all 20 housing authorities covering 53 developments. This represents a response rate of 100 percent for housing authorities and 90 percent with respect to developments. Combining the two samples, our overall response rate was 96 percent for housing authorities, covering 95 percent of developments in the total sample.

Although a high response rate was achieved, the quality of the data provided by the housing authorities varied greatly. In a few cases, backup documentation was provided, making it easy to confirm the accuracy of the numbers. However, in many cases the data items were either left blank or contained numbers that appeared to be incorrect or inconsistent. In these cases, it was difficult to confirm the accuracy of the number since no documentation was provided. Smaller housing authorities appeared to have difficulty completing the form, as they are not required to complete the Comprehensive Grant applications that force the larger housing authorities to track and plan modernization spending.

The analysis file contains the following information from the housing authority Background Data forms:

- Per-Unit Estimate Hard Cost for Physical Needs—development level

¹ Although the supplemental sample consists of 23 housing authorities, 3 of these were already in our original sample (we only sampled new developments there), so in fact we requested new information from only 20 housing authorities.

- Per-Unit Estimate Hard Cost for Physical Needs—housing authority level
- Per-Unit Modernization Funding Received in 1993-1996
- Per-Unit Modernization Funding in Next Four Years
- Ratio of Public Housing Units to the Total

III. Secondary Data

This section describes the secondary data sources used to complete the database used for analysis for this study. Besides the inspection data and data provided directly from the public housing authorities, we used the following secondary datasets, most of which were directly available from HUD Central Office computers. These datasets include the:

- PIH Master Universe File
- PIH Integrated Business System (IBS)
- HUD’s Picture of Subsidized Households Database
- HUD’s Public Housing Management Assessment Program (PHMAP) Database

PIH Master Universe File. This 1997 database provided by HUD was used to create the sampling universe for the study. The database also provided the variables “number of available units for each housing authority,” “vacancy rate,” and “average bedroom size,” that were used in the analysis file.

PIH Integrated Business System (IBS). This system, extracted in 1997, was provided to Abt Associates Inc. by HUD. The database was used to extract “date of full availability” (DOFA) and “structure type.” It also contained the most up-to-date contact information for the housing authorities in our sample.

HUD’s Picture of Subsidized Households Database. The 1998 Picture of Subsidized Households is a HUD database available on the HUD User Website (<http://www.huduser.org/datasets/assthsg/statedata98>) and offers a variety of data about HUD-subsidized housing. In total, the database contains information on approximately five million HUD-subsidized units; of these, about a quarter (1.3 million) are units in public housing developments. Data are presented at the levels of county, state, housing authorities, Census tracts, and developments. With regard to public housing, data are available on 3,200 housing authorities and 14,045 developments. Data from HUD files is the most recent available (usually from 1998), and not always complete. Certain data elements from the 1990 Census are also contained in this database. Our analysis file included the following variables from The Picture of Subsidized Housing database:

- Percent of Single Parents with Children

- Average Household Size
- Percent of Elderly or Disabled
- Percent of Head of Household that are Older Than 62 Years
- Occupied Units as a Percent of Available Units

HUD's Public Housing Management Assessment Program (PHMAP) Database. This database evaluates the performance of public housing authorities in major areas of management operations. The PHMAP database used for this study was created in 1996. The database does not contain any information for Puerto Rico and many of the fields within the database are missing information.

Our analysis file contains the following variables from the PHMAP database:

- Overall PHMAP Score
- Grade for Modernization
- Actual Vacancy Rate - Housing Authority Level
- Adjusted Vacancy Rate - Housing Authority Level
- Percent of Rents Uncollected

IV. Quality Control and Data Cleaning

Quality control measures were employed during all stages of the data collection process. For example, the inspection forms and the data abstraction forms used to collect data from the housing authorities were carefully designed and pre-tested to ensure that they obtained the necessary information in a consistent and accurate manner. In addition, the inspectors from the DLR Group were experienced professionals who participated in a week-long training to ensure a complete understanding of the Observable Systems methodology and the protocol to use in dealing with housing authorities. Finally, after the inspection forms were completed they were reviewed by the inspector, a senior DLR staff member, and Abt Associates Inc. coding staff to identify any missing information, apparent errors, or inconsistencies. These problems were then corrected through consultation with the inspector.

In addition to the quality control measures listed above, for each data collection component of this study Abt Associates Inc. staff did extensive data cleaning for completeness and consistency. After the data was produced in an electronic format, a multi-stage data cleaning process was performed by Abt Associates Inc. project staff, testing for internal consistency and checking for plausible ranges. Problems were resolved by consulting hard-copy forms and requesting clarification from DLR Group staff. Any out-of-range values from the inspection data were looked up and re-verified.

Finally, for each data collection component, a quality control check on at least 10 percent of the work was conducted. This quality control check included repeating 10 percent of the physical needs inspections, as well as 100 percent verification on all data entry tasks.

Exhibit B-6: Data Abstraction Form, Housing Authority Level:

HUD FORMULA CAPITAL STUDY PUBLIC HOUSING AGENCY BACKGROUND DATA FORM

The seven questions on this data form will provide essential information on this agency. Many of the items are reported to HUD as part of the Comprehensive Grant Plan or CIAP application.

Name of this PHA: _____

Person to contact with questions about this form: _____ Phone #: (_____) _____

1. Subsidized Housing Programs at this Public Housing Agency:

For the most recent year, please specify the number of units covered for each program listed. If this HA does not receive funding from the listed sources, check "Does Not Apply".

Funding Source	Does Not Apply	Units Covered by Program
Federal Public Housing	<input type="checkbox"/>	#
Section 8 vouchers and certificates	<input type="checkbox"/>	#
State-funded public housing programs	<input type="checkbox"/>	#
State tenant-based assistance	<input type="checkbox"/>	#
Municipally funded public housing programs	<input type="checkbox"/>	#
USDA rural rental housing program (formerly FmHA)	<input type="checkbox"/>	#
Other (specify:) _____	<input type="checkbox"/>	#

2. For the most recently completed (Federal or Agency) fiscal year, how many public housing units were removed from the ACC?

FFY____ (or Agency FY _____) Units removed from the ACC: _____ ☐ None

2a. Estimate of public housing units **to be removed** during the current fiscal year: _____ ☐ None

3. Special Arrangements

Is this PHA subject to special arrangements such as private management, receivership or HUD takeover, or some other arrangement?

Private management (modernization only) ☐ Yes ☐ No

Private management (overall) ☐ Yes ☐ No

Receivership or HUD takeover ☐ Yes ☐ No

Other (Specify below:) ☐ Yes ☐ No

Other Special Arrangements: _____

INFORMATION ON MODERNIZATION FROM COMPREHENSIVE PLANS OR OTHER SOURCES

Comp Grant-eligible agencies:

Much of the following information is normally specified in Comprehensive Plans. Please provide this information to us either by attaching the relevant excerpt from your Comprehensive Plan, or by writing the information directly on this form.

CIAP agencies:

Please record the information directly on this form.

4. Number of Units after Completing the next 5 Years of Planned Modernization

Please indicate the total number of units you expect to have in five years. Include in this total **all** units, not just modernized ones. Be sure to include modernization funded through CIAP, CGP, funded Vacancy Reduction Grants, and funded HOPE VI Implementation grants.

4a. Which is the "5th year" that the information refers to: FFY _____

Number of units to be rehabbed, next 5 years _____

Number of new units to be added, next 5 years _____

Number of units maintained as is, next 5 years _____

Number of units to be demolished, next 5 years _____

Net total units after 5 years _____

5. Please attach *HUD Form 52831* for the current Federal Fiscal year,¹ **OR** please provide the estimated modernization costs for the current year as well as the estimate of hard costs for physical needs in the space below.

5a. What is the preliminary **estimated grand total of cost of HA modernization** for the current year? If none is estimated, please write in "0."

\$ _____

☐ If estimated from a source other than HUD Form 52831, please describe the method used to derive it: _____

5b. What is the **preliminary total estimated hard cost for physical needs** for this HA? If none is estimated, please write in "0."

\$ _____

☐ If estimated from a source other than HUD Form 52831, please describe the method used to derive it: _____

5c. What is the **total number of units** included in this estimate?

¹ CGP agencies only.

6. Modernization Funding Received in 1997 and 1996.

Please attach (Comp Grant agencies) Form HUD-52837, *Annual Statement / Performance and Evaluation Report, Part I: Summary*, **or** (CIAP agencies) HUD Form 52825, *CIAP Budget/Progress Report* for the years 1997 and 1996, **OR** please indicate modernization funding received in 1997¹ and 1996 for the expense categories listed below. Please report the **actual** amounts (not estimated amounts). Please indicate at the bottom of the table if the numbers are obligated, expended, or original estimates. If no funding was received, please write in "0."

Funding	1997	1996
Non-CGP (or Non-CIAP) funds	\$	\$
CGP/CIAP funds: Check whether the funding source is: <input type="checkbox"/> CGP or <input type="checkbox"/> CIAP		
Operations	\$	\$
Management improvements	\$	\$
Administration	\$	\$
Audit ²	\$	\$
Liquidated damages	\$	\$
Fees and costs	\$	\$
Site acquisition	\$	\$
Site improvement	\$	\$
Dwelling structures	\$	\$
Dwelling equipment—nonexpendable	\$	\$
Nondwelling structures	\$	\$
Nondwelling equipment	\$	\$
Demolition	\$	\$
Replacement reserve ²	\$	\$
Relocation costs	\$	\$
Mod used for development	\$	\$
Contingency ²	\$	\$
Total CGP (or CIAP) grant amount	\$	\$
Lead-based paint activities (LBP)	\$	\$

Numbers reported are: (check one)

- ☐ Expended
☐ Obligated
☐ Original estimates

- ☐ Expended
☐ Obligated
☐ Original estimates

¹ Whether from that funding stream or from that year and previous years.

² CGP agencies only.

7. Modernization Spending Planned, by Categories, for next Four Years

Comp Grant HAs:

Please attach the most recent *Form HUD-52834, Five Year Action Plan, Part I: Summary*, from your current Comprehensive Plan. If unavailable, please indicate your total planned modernization spending for the next four years for the spending categories listed below.

Which years does the information refer to?

Year 2 = FFY 19_____

Year 3 = FFY _____

Year 4 = FFY _____

Year 5 = FFY _____

	Total, Next Four Years
Non-CGP funds	\$
CGP funds::	
Physical improvements	\$
Management improvements	\$
HA-wide nondwelling structures and equipment	\$
Administration	\$
Other	\$
Operations	\$
Demolition	\$
Replacement reserve	\$
Mod used for development	\$
Total CGP grant amount	\$

Exhibit B-7: Data Abstraction Form, Development Level

HUD FORMULA CAPITAL STUDY
BACKGROUND DATA FORM FOR DEVELOPMENTS

Sampled Development: _____

Person to contact with questions about this form: _____ Phone #: (_____) _____

1. Special arrangements:
- | | Yes | No | |
|---------------------|----------------------------|--------------------------|-------------------|
| Resident management | <input type="checkbox"/> | <input type="checkbox"/> | |
| Private management | <input type="checkbox"/> | <input type="checkbox"/> | |
| Other | <input type="checkbox"/> * | <input type="checkbox"/> | * Describe: _____ |

2. Modernization: Please provide the number of units at this development in the next 5 years:

Number of units to be rehabbed, next 5 years _____

Number of new units to be added, next 5 years _____

Number of units maintained as is, next 5 years _____

Number of units to be demolished, next 5 years _____

Net total units after 5 years _____

3. LBP/Asbestos abatement expenditures:

Most recent year: \$_____ ☐ Actual ☐ Estimate Source: _____

Total, last 3 years (including most recent year): \$_____ ☐ Actual ☐ Estimate Source: _____

4. Please attach HUD Form 52832 (Comp Grant agencies only), **OR** list here the estimate of *per-unit* hard cost for physical needs:¹

\$_____ per unit Number of units: _____

5. Please attach HUD Form 52837 (Comp Grant agencies only), *Performance and Evaluation Report, Part II: Supporting Pages for 1997*,² **OR** list here the:

Modernization funding *received in FY 1997* for this development: total actual cost (obligated or expended numbers are preferred; if they are not available, please provide revised or original numbers):

\$_____

Number reported is (check one): ☐ Expended ☐ Obligated ☐ Revised estimate ☐ Original estimate

6. Please attach HUD Form 52837 (Comp Grant agencies only), *Performance and Evaluation Report, Part II: Supporting Pages for 1993-1996*,² **OR** list here the:

Modernization funding *received in the four prior years (1993-1996)*, for this development: total actual cost (obligated or expended numbers are preferred; if they are not available, please provide revised or original numbers):

\$_____

Number reported is (check one): ☐ Expended ☐ Obligated ☐ Revised estimate ☐ Original estimate

7. Please attach HUD Form 52834, *Five Year Action Plan, Part I: Summary, Part A: Work Statements, and Part II, Supporting Pages, Physical Needs*, **OR** list here the modernization spending *planned for the next four years*, for this development: total estimated cost:

\$_____

¹ Please provide the estimated per-unit hard cost for physical needs. This is the estimated hard cost of **needed physical improvements** at this development divided by the number of units at this development. **Needed physical improvements** are those needed to bring the development (dwelling and non-dwelling structures,

dwelling and non-dwelling equipment, and site) up to a level at least equal to the modernization and energy conservation standards, as well as replacement of equipment, systems, and structure elements needed within the next five years.

² For CIAP-receiving agencies, attach *HUD Form 52825, CIAP Budget/Progress Report, Parts II and III*.

HUD FORMULA CAPITAL STUDY BACKGROUND DATA FORM

INSTRUCTIONS

1. **Special Arrangements.** Please indicate if the sampled development is subject to special arrangements such as resident management, private management, or other arrangement.

Information on Modernization

Comp Grant HAs: For developments with modernization funded under the Comprehensive Grant Program, much of the information requested is normally specified in Comprehensive Plans. Please provide this information to us either by attaching the relevant excerpt, or by writing the information directly on this form— whichever is more convenient for you.

CIAP HAs: If requested information is available on a standard HUD form, you may attach the form. Otherwise, please provide the estimates directly on this form.

2. **Net Total Units after Completing the next 5 Years of Planned Modernization.** Please indicate the number of units to be rehabilitated, new units, other units maintained as is, and units to be demolished after completing the next five years of planned modernization.

Be sure to include modernization funded through CIAP or CGP.

3. Please list the total expenditures related to lead-based paint or asbestos abatement for the most recent year and the total expenditures for the most recent three years. If actual expenditures are not available, please provide an estimate and its basis.

4. Please provide the estimated per-unit hard cost for physical needs. This is the estimated hard cost of **needed physical improvements** at this development divided by the number of units at this development.

Needed physical improvements are those needed to bring the development (dwelling and non-dwelling structures, dwelling and non-dwelling equipment, and site) up to a level at least equal to the modernization and energy conservation standards, as well as replacement of equipment, systems, and structure elements needed within the next five years.

5. **Modernization Funding Received in 1997.** Please indicate modernization funding received in 1997 for the major work categories listed in the modernization plan. Obligated or Expended numbers are preferred. If they are not available, please provide revised or original numbers. In computing the total, include not only development-specific activities but also the development's portion of PHA-wide activities.
6. **Modernization Funding Received in the Four Most Recent Years.** Please indicate modernization funding received in the four most recent years (generally, these are the years 1993-1996) for the major work categories listed in your Comprehensive Plans or CIAP grants for those years. Obligated or Expended numbers are preferred. If they are not available, please provide revised or original numbers. In computing the total, include not only development-specific activities but also the development's portion of PHA-wide activities.
7. **Modernization Spending Planned for the next Four Years.** Please indicate planned modernization spending in major work categories for the next four years (Comp Grant HAs: Years 2-5 of the current Comprehensive Plan; generally these are the years 1998-2001). Please provide a sum over all four years. In computing the total, include not only development-specific activities but also the development's portion of PHA-wide activities.

Appendix C:

System for Estimating Inspection-Based Existing Modernization Needs And Accrual Costs From Inspections

This appendix outlines the approach used to estimate existing modernization needs and accrual costs based on the observations made during physical inspections of the properties. *Existing modernization needs* are costs that would have to be expended in order to provide decent and sustainable housing with modest amenities. These costs include *immediate repair needs*, which are the costs required to repair or replace systems that are not in working order. Existing modernization needs also include costs for *upgrades and additions* to some systems and the *replacement of systems* that have reached the end of their expected useful life, even if they are still in working order. Accrual costs are costs expected in the future that are associated with major repair and replacement of systems as they age over the next 20 years.

The first section of this appendix describes the method for arriving at costs of immediate repair needs. The second section describes the method used to obtain existing modernization needs costs. The third section addresses the method for estimating the future accrual of major repair and replacement costs.

I. Estimating Immediate Repair Needs from Property Inspections

The process of estimating immediate repair needs based on the property inspections involved five steps:

- Conducting a *physical inspection* of the overall site and up to 3 buildings and 3 units within each property in the sample (135 systems or groupings of physical features were inspected in the properties);
- Generating a system-level *cost file*;
- Calculating system-level *costs for the site and inspected units and buildings*;
- Computing *property-level costs* by inferring costs for uninspected units and buildings from inspected units and buildings; and
- Adjusting the property-level costs for *locational cost differences* and for *soft costs* associated with the modernization process.

Physical Inspection of the Property

The physical inspection method—the Observable Systems Method—was described previously in "Appendix B: Data Collection Summary." The inspection produces information for each property on: the current condition and immediate repair action level for each of 135 systems for the site and for the buildings and units that were inspected; modernization needs to provide decent and sustainable housing with modest amenities; and property takeoffs—a complete inventory of the presence, count, age, type, and dimensions of components.

System-Level Cost File for Computing Physical Needs

As was discussed in Appendix B, under the Observable Systems Method, the costs of carrying out the repair actions recorded by the inspector were computed off-site using a computerized cost file and program. The first step in generating the cost file was developing up to five system-specific, categorized levels of repair, ranging from no action to replacement of a system, to correspond to action levels the inspector would use to describe the repairs needed to bring the system up to a working, safe, and sound condition. The action level groups are:

- NA for no action
- MIN for minor repair
- MOD for moderate repair
- MAJ for major repair, and
- REP for replace.

For any system, each action level denotes a specific repair action. For example, for ranges and hoods (a dwelling unit system), the MIN action is to replace a burner and clean the hood; the MOD action is to replace the hood; the MAJ action is to replace the range; and REP involves replacing the range and the hood. In the above example for ranges and hoods the MIN cost is \$108 for each kitchen requiring MIN action. MOD costs are \$246 for each kitchen requiring a MOD level of repair. MAJ costs are \$480 for each kitchen. REP costs are \$720. Costs for each action level for each system are presented in Exhibit C-1.¹ System repair costs were obtained from A.M. Fogarty & Associates, Inc., a firm with extensive experience in costing for private and public housing construction and modernization. Using the precise definitions of the action levels described above, A.M. Fogarty & Associates, Inc. developed a series of costs for each action level for each system that reflect the materials commonly used for public

1 In a few cases the cost element for a more major action is less than the cost element for a lesser action due to action-level definitions and cost algorithms that account for implied percentages and quantities.

or low-income housing. Abt Associates Inc. has used this firm's estimation services for several HUD studies. Costs are for the Washington, D.C.

	Exhibit C-1: Repair Action Level Cost Elements					
SYSTEMS	MINOR	MODERATE	MAJOR	REPLACE	UNIT OF MEASURE	ASSUMPTIONS
***SITE SYSTEMS						
Landscape	0.12	0.29	0.88	1.18	Landscape-SF	
Roadways	0.15	0.39	0.83	2.40	Road-SF (min 1000)	
Parking Areas-Lots	0.12	0.50	2.08	2.40	Parking-SF;# of new spaces	360 SF per square
Parking Areas-Garages	0.02	0.77	2.18	2.75	Park-SF (min 1000)	
Paved Pedestrian Areas	0.31	0.77	2.30	4.57	PvdPed SF (min 1000)	
Curbing-Bituminous	N/A	N/A	N/A	5.42	Curbing LF	
Curbing-Concrete	N/A	N/A	4.69	14.08	Curbing LF	
Curbing-Granite	N/A	2.28	8.38	N/A	Curbing LF	
Fencing-Chain Link	N/A	N/A	N/A	15.74	Fencing LF	
Fencing-Wrought Iron	N/A	N/A	N/A	64.14	Fencing LF	
Fencing-Wood Stockade	N/A	N/A	N/A	16.04	Fencing LF	
Fencing-Concrete	N/A	N/A	N/A	138.00	Fencing LF	
Fencing-Tubular	N/A	N/A	N/A	43.70	Fencing LF	
Retaining Walls-Concrete	N/A	3.06	N/A	35.82	Retain Wall-LF	
Retaining Walls-RR Ties	N/A	0.75	N/A	25.34	Retain Wall-LF	
Site Drainage-Underground	N/A	900.00	2814.00	4500.00	# Catch Basin	
Site Drainage-Surface	N/A	0.58	2.50	N/A	Landscape SF	
Dumpsters and Enclosures	1100.00	2750.00	4700.00	6200.00	# Dumpsters	
Pole Mounted Site Lighting	500.00	800.00	2000.00	3500.00	# Poles	
Private Yards and Enclosures	N/A	580.00	N/A	1162.00	# Yards	
Site Furniture	40.00	250.00	250.00	250.00	# Units	Min 10% of units, Mod 25%, Maj 66%, Replace 100%
Basketball Courts	3142.00	5152.00	N/A	12274.00	# Courts	
Site Electrical Distribution-Over	N/A	N/A	55.00	80.00	Site Elec Dist-LF	
Site Electrical Distribution-Under	N/A	N/A	115.00	150.00	Site Elec Dist-LF	
Heating Water Distribution-Steam	N/A	N/A	N/A	350.00	Heat Water Dist-LF	
Heating Water Distribution-Hot Water	N/A	N/A	N/A	189.00	Heat Water Dist-LF	
Domestic Hot Water Lines	N/A	N/A	N/A	43.00	Dom Hot Water -LF	
Domestic Cold Water Lines	N/A	N/A	N/A	28.00	Dom Cold Water-LF	
Gas Lines	N/A	N/A	N/A	34.00	Gas Lines-LF	
Main Water Service	N/A	N/A	N/A	47.00	Main Water Serv-LF	
Site Sanitary Lines	N/A	N/A	N/A	42.00	Site Sanitary-LF	
Septic System	N/A	N/A	400.00	8000.00	Units	
Sewage Ejectors	800.00	1400.00	2000.00	3500.00	# Ejectors	

		Exhibit C-1: Repair Action Level Cost Elements				
SYSTEMS	MINOR	MODERATE	MAJOR	REPLACE	UNIT OF MEASURE	ASSUMPTIONS
Hydrants	N/A	N/A	N/A	2200.00	# Hydrants	

		Exhibit C-1: Repair Action Level Cost Elements				
SYSTEMS	MINOR	MODERATE	MAJOR	REPLACE	UNIT OF MEASURE	ASSUMPTIONS
***UNIT SYSTEMS						
Walls & Ceilinas: Partitions (not K&B)	N/A	N/A	N/A	3.25	SF	
Walls & Ceilinas: Surfaces (not K&B)	0.74	1.44	N/A	2.60	SF	
Floor Sub-base (not K&B)	N/A	N/A	N/A	3.55	SF	
Floor Covering-Carpet (not K&B)	N/A	N/A	N/A	2.39	SF	
Floor Covering-Resilient (not K&B)	N/A	N/A	N/A	2.98	SF	
Interior Doors & Frames	N/A	66.00	324.00	496.80	# Doors needing action	
Kitchen Walls & Ceilings: Partitions & Surfaces	0.90	1.50	N/A	3.90	SF	
Kitchen Floor Covering & Sub-base	N/A	N/A	4.31	8.57	SF	
Cabinets/Counter Top/Sink	960.00	600.00	2100.00	3300.00	# needing replacement	
Range	66.00	N/A	400.00	N/A	# needing replacement	
Range & Hood	108.00	246.00	480.00	720.00	# needing replacement	
Refrigerator	N/A	N/A	N/A	840.00	# needing replacement	
Bathroom Walls & Ceilings: Partitions & Surfaces	0.66	4.60	8.68	13.20	SF	
Bathroom Flr Cvr & Sub-base-Tile	N/A	N/A	9.64	13.19	SF	
Bathroom Flr Cvr & Sub-base-Resil			3.59	7.14	SF	
Bathroom Fixtures-Sink	225.00	N/A	N/A	500.00	# needing replacement	
Bathroom Fixtures-Toilet	175.00	N/A	N/A	575.00	# needing replacement	
Bathroom Fixt-Tub/Shower-Porcelain	300.00	N/A	N/A	1400.00	# needing replacement	
Bathroom Fixt-Tub/Shower-Fiberglass	300.00	N/A	N/A	845.00	# needing replacement	
Bathroom Accessories	N/A	108.00	191.00	250.00	# needing replacement	
Bathroom Vanities-24"	N/A	N/A	N/A	405.00	# needing replacement	
Bathroom Vanities-36"	N/A	N/A	N/A	570.00	# needing replacement	
HVAC Unit-Heat Only	N/A	440.00	N/A	984.00	# needing replacement	
HVAC Unit-Heat/Cool	N/A	770.00	N/A	5880.00	# needing replacement	
HVAC-Swamp Cooler	N/A	660.00	N/A	1650.00	# needing replacement	

		Exhibit C-1: Repair Action Level Cost Elements				
SYSTEMS	MINOR	MODERATE	MAJOR	REPLACE	UNIT OF MEASURE	ASSUMPTIONS
HVAC Unit-W/A-Coil	N/A	1050.00	N/A	6900.00	# needing replacement	

		Exhibit C-1: Repair Action Level Cost Elements				
SYSTEMS	MINOR	MODERATE	MAJOR	REPLACE	UNIT OF MEASURE	ASSUMPTIONS
***UNIT SYSTEMS (Continued)						
Radiation-Hvdronic	N/A	10.70	N/A	21.40	LF	
Radiation-Electric	N/A	N/A	N/A	11.60	LF	
Unit Boiler	N/A	875.00	N/A	2610.00	# needing replacement	
Unit Furnace	N/A	550.00	N/A	1122.00	# needing replacement	
Unit Dom Hot Water Generation	N/A	165.00	N/A	520.00	# needing replacement	
Temperature Controls	N/A	N/A	N/A	81.00	# Temp Controls	
Wall/Window Air Conditioner	N/A	N/A	N/A	750.00	# Wall/Window AC's	
Unit Electrical Panel	N/A	N/A	N/A	1230.00	1 per Unit	
Unit Electrical Wiring	N/A	N/A	N/A	3.50	Total Unit SF	
Bell/Intercom Svstem	N/A	N/A	N/A	194.90	# needing replacement	
Closed Circuit TV	N/A	N/A	N/A	115.00	# needing replacement	
Emergencv Call Alarm Svstem	N/A	N/A	N/A	140.00	# needing replacement	
Smoke/Fire Detection-Battery	N/A	N/A	N/A	44.00	# needing replacement	
Smoke/Fire Detection-Hard Wire	N/A	N/A	N/A	148.00	# needing replacement	

		Exhibit C-1: Repair Action Level Cost Elements				
SYSTEMS	MINOR	MODERATE	MAJOR	REPLACE	UNIT OF MEASURE	ASSUMPTIONS
***BUILDING ENVELOPE						
Foundation-4 Foot	0.72	N/A	16.86	N/A	Perimeter-LF	
Foundation-8 Foot	N/A	8.40	33.30	N/A	Perimeter-LF	
Slab—Slab	N/A	0.50	2.09	6.32	Footprint-SF	
Slab-Basement	N/A	0.50	2.15	6.40	Footprint-SF	
Exterior Wall-Masonrv	1.10	N/A	4.25	16.20	Masonrv-SF	
Exterior Wall-Plaster	1.10	N/A	1.58	10.00	Plaster-SF	
Exterior Wall-Wood	1.10	1.40	1.28	7.75	Wood-SF	
Exterior Wall-Vinyl/Aluminum	1.10	1.40	0.80	5.50	Vinyl/Aluminum-SF	
Insulation-Wall	N/A	N/A	0.60	N/A		
Insulation-Ceiling	N/A	N/A	1.25	N/A		
Roof Covering-EDPM	0.28	0.55	2.15	4.63		
Roof Covering-Shingle	0.20	0.40	1.60	2.30		
Roof Covering-Built-Up	0.25	0.52	2.06	5.15		
Roof Covering-Tile	1.00	1.98	7.90	8.90		
Roof Covering-Metal	1.25	2.60	10.50	11.60		
Parapet Wall	N/A	79.00	N/A	79.00	Perimeter-LF	3 ft high
Chimney (Brick)	138.94	N/A	N/A	1120.37	# Chimneys	2'x2'x4' high
Roof Hatches-Small	N/A	N/A	N/A	521.00	# Roof Hatches	< 10 SF
Roof Hatches-Medium	N/A	N/A	N/A	720.00	# Roof Hatches	10-20 SF
Roof Hatches-Large	N/A	N/A	N/A	1300.00	# Roof Hatches	20-30 SF
Skylights-Small	N/A	N/A	N/A	521.00	# Skylights	< 10 SF
Skylights-Medium	N/A	N/A	N/A	666.00	# Skylights	10-20 SF
Skylights-Large	N/A	N/A	N/A	873.00	# Skylights	20-30 SF
Penthouses-Small	N/A	N/A	2787.40	5654.00	# Penthouses	4'x10'x8'
Penthouses-Medium	N/A	N/A	5830.00	11330.00	# Penthouses	8'x14'x10'
Penthouses-Large	N/A	N/A	10560.00	21560.00	# Penthouses	20'x20'x10'
Roof Drainage-Exterior	N/A	N/A	N/A	2.20	SF	
Roof Drainage-Interior	N/A	N/A	1.10	N/A	SF	
Windows-Small	198.00	235.00	275.00	550.00	# Windows needing action	<15 SF
Windows-Medium	396.00	451.00	550.00	750.00	# Windows needing action	<30 SF
Windows-Large	594.00	649.00	715.00	1300.00	# Windows needing action	>30SF
Window Security Grates	N/A	N/A	82.50	400.00	# Grates needing action	

		Exhibit C-1: Repair Action Level Cost Elements				
SYSTEMS	MINOR	MODERATE	MAJOR	REPLACE	UNIT OF MEASURE	ASSUMPTIONS
Exterior Common Doors-Wood	220.00	N/A	1275.00	1500.00	# Doors needing action	
Exterior Common Doors-Metal	220.00	N/A	1275.00	1500.00	# Doors needing action	
Exterior Common Doors-Glass	220.00	N/A	1275.00	1500.00	# Doors needing action	
Unitv Entrv Doors-Wood	220.00	N/A	665.50	821.70	# Doors needing action	
Unitv Entrv Doors-Metal	220.00	N/A	737.00	893.20	# Doors needing action	
Unitv Entrv Doors-Glass	220.00	N/A	929.50	1085.70	# Doors needing action	
Storm/Screen Doors	N/A	N/A	N/A	400.00	# Doors needing action	
Canopies-Small	N/A	253.00	N/A	913.00	# Canopies needing action	6'x4'
Canopies-Medium	N/A	1013.10	N/A	3653.10	# Canopies needing action	6'x16'
Canopies-Large	N/A	3168.00	N/A	11418.00	# Canopies needing action	10'x30'
Exterior Stairways-Wood	385.00	N/A	825.00	2500.00	# Flights needing action	
Exterior Stairways-Concrete	605.00	N/A	1210.00	5005.00	# Flights needing action	
Building Mounted Site Lights	N/A	350.00	N/A	660.00	# Lights needing action	
Fire Escapes	N/A	385.00	N/A	7986.00	# escapes*#stories	
Balconies-Wrought Iron	41.00	132.00	N/A	N/A	# Balconies needing action	
Balconies-Wood	44.00	58.00	1425.00	3000.00	# Balconies needing action	
Balconies-Masonry	35.50	126.00	N/A	N/A	# Balconies needing action	
Porches (w/roof)	N/A	990.00	N/A	10000.00	# Porches needing action	
Decks (without roof)	N/A	880.00	N/A	6000.00	# Decks needing action	
Attached Storage Sheds	N/A	440.00	N/A	2500.00	# Sheds needing action	
Vestibules	6.45	N/A	12.00	N/A	Vestibules SF	
Corridors	5.01	7.23	12.78	15.00	Corridors SF	
Stairways	4.59	6.17	15.00	38.94	SF	
Interior Lighting	N/A	1.10	N/A	3.03	SF	
Mail Facilities-Kiosk	N/A	N/A	N/A	120.00	# Mail Boxes needing action	
Mail Facilities-Box	N/A	N/A	N/A	84.96	# Mail Boxes needing action	
Laundry Rooms	3.86	8.15	12.00	31.80	SF	
Laundry Equipment	N/A	220.00	1000.00	1660.00	# pieces of equipment needing action	
Common Rooms	3.86	7.20	N/A	12.00	Common Room -SF	
Common Kitchens	4.62	7.70	N/A	44.00	Common Kitchen -SF	
Underground Garage	0.02	0.77	1.10	N/A		

		Exhibit C-1: Repair Action Level Cost Elements				
SYSTEMS	MINOR	MODERATE	MAJOR	REPLACE	UNIT OF MEASURE	ASSUMPTIONS
**BME/CME						
Heating Risers	110.00	137.50	192.50	290.00	Units	
Gas Distribution	100.00	175.00	275.00	300.00	Units	
Dom. Hot & Cold Water Distribution	137.50	247.50	400.00	525.00	Units	
Sanitary Distribution-PVC	55.00	110.00	220.00	330.00	Units	
Sanitary Distribution-Cast Iron	137.50	247.50	385.00	495.00	Units	
Fire Sprinkler System	0.28	0.55	2.20	38500.00	SF for minor-major: 1 for replace	
Smoke/Ventilation Control	N/A	0.10	0.15	0.35	Area SF	
Sump Pumps-Residential	N/A	220.00	N/A	550.00	# Sump Pumps	
Sump Pumps-Commercial	N/A	440.00	N/A	1760.00	# Sump Pumps	
Compactors-Small	N/A	1100.00	N/A	5500.00	# Compactors	
Compactors-Large	N/A	1166.00	N/A	11000.00	# Compactors	
Central Vent & Exhaust	N/A	0.83	1.38	2.20	Area SF	
Central Air Conditioning	N/A	1.65	N/A	5.00	Area SF	
Switchgear	N/A	N/A	0.39	1.65	Area SF	
Building Power Wiring	N/A	N/A	N/A	2.70	Area SF	
Emergency Lights	N/A	N/A	N/A	467.50	Bldg Units / 6	
Emergency Generator	250.00	500.00	10000.00	20000.00	# Generators	
Smoke/Fire Detection-Battery	N/A	N/A	N/A	44.00	Bldg Units / 4	
Smoke/Fire Detection-Hardwire	N/A	N/A	N/A	148.50	Bldg Units / 4	
Communication System	N/A	N/A	N/A	1500.00	Bldg Units / 6	
Emergency Call Alarm System	N/A	N/A	N/A	1500.00	Bldg Units / 6	
Master TV Antenna	N/A	N/A	2200.00	4950.00	Bldg Units / 6	
Closed Circuit TV	N/A	N/A	N/A	1500.00	Bldg Units / 6	
Hot Air Furnace	N/A	247.50	742.50	1650.00	Units	
Purchased Steam Supply	N/A	75.00	185.00	740.00	Units	
Solid Fuel Storage	N/A	55.00	185.00	555.00	Units	
Heat Exchanger	N/A	30.00	110.00	210.00	Units	
Cold Water Supply-Pump	N/A	10.00	15.00	25.00	Units	
Cold Water Supply-Soft	N/A	10.00	15.00	25.00	Units	
Cold Water Supply-Both	N/A	15.00	25.00	30.00	Units	
**BME/CME (Continued)						

		Exhibit C-1: Repair Action Level Cost Elements				
SYSTEMS	MINOR	MODERATE	MAJOR	REPLACE	UNIT OF MEASURE	ASSUMPTIONS
Boilers-Hot Water	N/A	385.00	605.00	1650.00	Units	
Boilers-Steam	N/A	404.00	635.00	1730.00	Units	
Boiler Room-Piping	330.00	550.00	990.00	1650.00	Units	
Boiler Room-Equipment	220.00	550.00	1100.00	1650.00	Units	
Boiler Room-Controls	N/A	165.00	N/A	660.00	Units	
DHW Generation	55.00	165.00	220.00	275.00	Units	
Elevator Shaftways-Hydraulic	3300.00	4400.00	6600.00	13200.00	# Elevators	
Elevator Shaftways-Hoist	2750.00	3300.00	5500.00	11000.00	# Elevators	
Shaftway Doors	550.00	1650.00	2200.00	3300.00	# Floors	
Cabs	1100.00	2750.00	2750.00	3850.00	# Elevators	
Machinery-Hydraulic	5500.00	11000.00	16500.00	27500.00	# Elevators	
Machinery-Hoist	2200.00	4400.00	6600.00	22000.00	# Elevators	
Interior Construction	10.00	20.00	35.00	65.00	Footprint-SF	

		Exhibit C-1: Repair Action Level Cost Elements				
SYSTEMS	MINOR	MODERATE	MAJOR	REPLACE	UNIT OF MEASURE	ASSUMPTIONS
**Central Facilities						
Structure Exterior-Masonry	10.00	20.00	40.00	120.00	Exterior-SF	
Structure Exterior-Plaster	10.00	15.00	35.00	115.00	Exterior-SF	
Structure Exterior-Wood	10.00	15.00	20.00	100.00	Exterior-SF	
Structure Exterior-Vinyl	10.00	15.00	20.00	95.00	Exterior-SF	
Community Room-Interior	10.00	20.00	35.00	65.00	Community Room-SF	
Kitchen Cabinet/Sink/Counter	1800.00	900.00	2200.00	3200.00	# Cabinets	
Kitchen Stove-No Hood	50.00	N/A	550.00	N/A	# Stoves w/out hood	
Kitchen Stove With Hood	75.00	200.00	N/A	750.00	# Stoves w/hood	
Kitchen Refrigerator	N/A	N/A	N/A	950.00	# Refrigerators	
Laundry Room-Interior	10.00	20.00	35.00	85.00	Laundry Room SF	
Laundry Equipment	N/A	150.00	750.00	1250.00	# Pieces	
Mail Facilities-Interior	10.00	20.00	35.00	65.00	Mail Facilities SF	
Mail Equipment-Kiosk	N/A	N/A	N/A	120.00	# Boxes	
Mail Equipment-Box	N/A	N/A	N/A	84.96	# Boxes	
Restroom Sink	225.00	N/A	N/A	500.00	# Sinks	
Restroom Toilet	175.00	N/A	N/A	575.00	# Toilets	
Restroom Accessories	N/A	500.00	N/A	1500.00	# Restrooms	
Restroom Interior	20.00	20.00	70.00	150.00	Restroom SF	
Other Room Interior	10.00	20.00	35.00	65.00	Other Room SF	

metropolitan area, and include parts, labor and contractor fees for the modernization project. Costs do not include soft costs such as design costs, architect and engineering costs, and costs associated with PHA management of the modernization process. Adjustments for locations outside Washington, D.C. and for soft costs are discussed below.

Not all systems have 5 action levels. For example, for refrigerators, the only action is REP, which replaces the refrigerator at a cost of \$840. The *Inspection Manual* for this study details each allowable action level for each system.

System-Level Costs for the Site and Inspected Units and Buildings

In this step, the inspector's observations and the cost files were combined to calculate, for each property, costs for repair actions on items that have been inspected. A mathematical algorithm was applied to each system the inspector checked off as needing some level of repair. The basic concept is multiplying unit cost by a quantity measure, where the quantity measure may be scaled by a percentage of the item affected.

For example, for windows the algorithm first checks for the size of the windows—small (<15 sf), medium (15-30 sf), or large (>30 sf). For each window size found, the algorithm multiplies the number of windows of that size by the cost element associated with the windows action level noted on the Building Envelope booklet. For example, if a property had 10 small windows requiring MIN action, and 10 small windows requiring replacement, then the immediate repair needs for windows would be \$7,480. The calculation is as follows: 10 (number of small windows requiring MIN action) * \$198 (the MIN cost for a small window) + 10 (number of small windows requiring REP action) * \$550 (the REP cost for a small window). If the windows instead were large, the algorithm would be: 10 * \$594 + 10 * \$1,300 = \$18,940.

A COBOL program was written to process the clean database by relating all the inspection data collection instruments to each other via the HUD Project ID. An immediate repair needs cost was then calculated for each system that required some repair or replace action. When a cost element was on a per square foot basis, the algorithms made use of the takeoff data. Other cost algorithms were based on the number requiring action, as in the case of windows described above. Exhibit C-1 shows the multiplier for each cost element in addition to showing the cost for each action level.

After the per-system costs were calculated, they were grouped together to form system groups. For example, the Building Envelope system group called *Windows and Doors* includes the inspection systems: windows, window security grates, exterior common doors, unit entry doors, and storm/screen doors. Exhibit C-2 shows which observable systems are included in each analysis group.

Exhibit C-2
System Groups and the Associated System Components for
Physical Needs Estimates

System Group Name	System Component	System Group Name	System Component
Unit Interior Construction	Interior Walls-Partitions	Roofs	Roof Covering
	Floors: Sub-base		Parapet Wall Chimney Roof Hatches Skylight Penthouse Roof Drainage
Unit Interior Finish	Interior Walls-Surface Floor Covering: Carpet Floor Covering: Resilient Interior Doors Kitchen Walls Kitchen Floor	Windows and Doors	Windows
	Bathroom Walls Bathroom Floor		Security Grates Exterior Common Doors Unit Entry Doors Storm/Screen Doors
Kitchen Fixtures	Kitchen Cabinet/Counter Kitchen Range Refrigerator	Exterior Features	Canopies Exterior Stairs Bldg Mounted Site Lights Fire Escapes Balconies Porches Decks
			Sheds
Bathroom Fixtures	Bathroom Fixtures Bathroom Accessories Vanities	Common Areas	Vestibules Corridors Interior Stairways Interior Lights Mail Facilities Laundry Rooms Laundry Equipment Common Rooms Common Kitchens Underground Garages
Unit Heating and Cooling	HVAC units		
	Radiation Boiler (Unit level) Furnace (Unit level) DHW Generation (Unit level) Temperature Control Wall Air Conditioner		
Unit Electrical	Electrical Panel Electrical Wiring Bell/Intercom CCTV ECAS Smoke Detector		
Building Exterior Closure	Foundation		
	Slab Exterior Wall Insulation		

- continued -

Exhibit C-2 (continued)

System Groups and the Associated System Components for Physical Needs Estimates

System Group Name	System Component	System Group Name	System Component
Building Mechanical and Electrical	Heating Risers	Site Areas	Landscaping
	Gas Distribution		Roadways
	Domestic Hot/Cold Water Dist		Parking Lots
	Sanitary Distribution		Parking Garages
	Fire Sprinkler System		Paved Pedestrian Area
	Smoke and Ventilation Control		Curbing
	Sump Pump		Fencing
	Compactors		Retaining Wall
	Switchgear		Site Drainage
	Building Wiring		Pole Mounted Site Lighting
	Emergency Lights		
	Emergency Generator	Site Amenities	Site Furniture
	Building Smoke Detector		Yards and Enclosures
	Communication System		Dumpsters
	Building ECAS		Basketball Courts
	Master TV Antenna		
	Building CCTV	Site Distribution	Site Electrical Distribution
	Cold Water Supply Station		Hot Water Distribution
			Domestic Hot Water Lines
			Domestic Cold Water Lines
Building Heating and Cooling	Central Vent/Exhaust		Main Water Service
	Central Air Conditioning		Gas Lines
	Furnace (Building level)		Site Sanitary Lines
	Purchased Steam		Septic System
	Fuel Storage		Sewage Ejectors
	Heat Exchanger		Hydrants
	Boiler (Building level)	Central Mechanical & Electrical Interior Construction	Interior Construction
	Boiler Room Piping		
	Boiler Room Equipment	Central Facilities Interior Construction	Exterior Construction
	Boiler Room Controls		Common Room Interior

Elevators	DHW Generation		Laundry Room Interior
	Shaftways		Mail Facility Interior
	Shaftway Doors		Restroom Interior
	Cabs		Other Room Interior
	Machinery		
		Central Facilities Equipment	Kitchen Cabinets
			Kitchen Stoves
			Kitchen Refrigerator
			Laundry Equipment
			Mail Facility Equipment
			Restroom Fixtures
			Restroom Accessories

Property-Level Costs

In order to generate costs for the property as a whole, costs for buildings and units that were not inspected needed to be estimated.¹

For each property, costs were generated for the residential buildings and units that were *not inspected* based on their relationship to buildings and units that were inspected. During the inspection, the inspector, in conjunction with the property manager, filled out an additional form—the ***Stock Inventory and Quality Distribution*** (SIQD). For each building in the development (whether inspected or not), the inspector recorded the age, overall building quality (excellent, good, fair or poor), the building type (high-rise, walk-up, garden, single-family detached), and a count of units in each size category (0BR/1Bath, 1BR/1Bath, 2BR/1Bath, 2BR/1+Baths, 3BR/1Bath, 3BR/1+Baths, 4BR/1Bath, 4BR/1+Baths, 5BR/1Bath, 5BR/1+Baths) in the building. The form also collected data, at a property level, on how many units overall (without a breakdown at the building level) in each size category fell into each quality category (excellent, good, fair, and poor).

In order to estimate the immediate repair cost for the *uninspected* units, the first step was to compute per square foot costs for each *inspected* dwelling unit (the costs for the inspected units divided by the overall square feet for the particular units). The estimated cost for the uninspected units was then simply their square footage multiplied by the average repair costs of inspected units of the same quality category. This was straightforward because inspectors had recorded average size in square feet for each unit size.

Estimating the costs for uninspected buildings was similar,² but more complex because inspectors did not collect square footages of uninspected buildings. In order to be able to apply costs from the inspected sample to the uninspected sample, the costs for the inspected buildings had to be normalized to account for differences in building sizes. We chose to normalize building costs to a per 2-bedroom equivalent. The computation to normalize the inspected building costs was as follows:

- 1) For each of five samples (housing authorities with fewer than 250 units, New York City, Chicago, Puerto Rico, and all other housing authorities), the overall sample average square feet for each unit size category was calculated as a weighted average of the square footage of all units in all buildings in the analysis sample properties, regardless of whether the building was inspected. The weights were the unit size distributions in each building.

¹ This is not true for Site Systems because all site elements were inspected.

² Central Mechanical Building Systems and Central Facility Building Systems were each represented in a single Central Building inspection form and thus uninspected building costs did not need to be estimated.

- 2) The number of 2BR/1Bath equivalent units in each building was calculated as the total square footage of living space in each building divided by the sample's average square footage of a 2BR/1 bath unit.¹ The total square footage of living space was calculated by multiplying the sample average square feet for each unit size by the number of units of that size in the building.
- 3) Building costs for each inspected building were normalized to a per-2BR cost equivalent by dividing total costs by the number of 2BR equivalent units in the building, thus generating a normalized cost for the inspected building, which could then be applied to the uninspected buildings.

Based on the assumption that buildings or units of the same type within the project will have similar costs, costs for the uninspected units and buildings were generated in one of the following ways:

- ***Same type-same quality.*** If the inspection included a building of the same type and quality as the uninspected building, the normalized 2BR equivalent cost (in the inspected building) was multiplied by the number of 2BR equivalent units in the uninspected building to produce the uninspected building's cost. Similarly, if the inspection included a unit of the same size and quality as the uninspected unit, its per square foot cost was multiplied by the total square feet of the uninspected unit to generate the cost for that uninspected unit.
- ***Same type-different quality.*** Ratios between quality categories within building type were calculated using the normalized costs for the inspected buildings. If multiple inspected buildings of the same type but with different quality existed for the project, the inspected building with the closest quality was used as a cost reference point. (Inspected buildings with poorer qualities were chosen if a choice needed to be made. In other words, if a Good high-rise needed to be costed and both an Excellent and a Fair high-rise had been inspected, the Fair high-rise would have been chosen as the reference point.) Once the inspected reference point was chosen, the normalized 2BR equivalent cost was first multiplied by the sample average ratio between the costs for the uninspected and inspected qualities for that building type, where, as noted above, averages were calculated for each of 5 samples. In the above example, the normalized 2BR equivalent cost for the Fair high-rise would have been multiplied by the ratio between the average for a Good high-rise and the average for a Fair high-rise within that HA's size category. Next, the cost was multiplied by

¹ The weighted average square footage of a 2 bedroom 1 bath unit was 772.8 SF in housing authorities with fewer than 250 units, 698.6 SF in New York City, 772 SF in Chicago, 678.2 SF in Puerto Rico, and 731.5 in all other housing authorities.

the appropriate factor¹ for the uninspected building.² For units, the quality ratios were calculated between the sample average per-square foot costs for each quality category. The inspected unit with the closest quality was chosen as the cost reference point and its normalized per-square foot cost was first multiplied by the appropriate quality ratio and then by the total square feet for the inspected units.

- ***Different building type.***³ If the inspection included no building of the same type, the ratio between the project cost and the appropriate sample's average cost for inspected buildings was applied to the sample's average cost for the type being costed. This ratio equals the sum of the actual inspected normalized costs for the project divided by the sum of the sample's weighted costs (i.e., the costs for the inspected buildings using the sample average costs for the inspected type/quality categories). To cost buildings with types different from those inspected in the project, the sample's averages for the uninspected type and quality were multiplied first by this project-to-sample ratio, and then by the appropriate factor (number of 2BR equivalent units) for the uninspected building being costed. For example, if a Good high-rise existed in a project for which only Poor walk-ups had been inspected, a project-to-sample ratio would have been calculated by dividing the sum of the inspected Poor walk-up building costs by the sample's average for a Poor walk-up multiplied by the number of 2BR equivalents for each inspected building in the project. The sample average for a Good high-rise would then be multiplied by this project-to-sample ratio, and then multiplied by the number of 2BR equivalents in the Good high-rise being costed.⁴
- ***Same quality-different bedroom size.*** If an inspected unit had the same quality as an uninspected unit but was of a different size, the per-square foot cost of the inspected unit in that quality category was simply multiplied by the total square feet of the uninspected unit.
- ***Different quality-different bedroom size.*** If a unit had not been inspected within the quality category of the uninspected unit, the average per-square foot cost for all inspected units in the property was used to estimate costs of the uninspected unit.

Adjustments to the Property-Level Cost Numbers for Locations and for Soft Costs

1 For buildings, the factor is the number of 2BR equivalents discussed above.

2 Overall, there were 19 properties that required estimating building costs for the same type but different quality buildings.

3 Based on the inspection protocol, this occurrence was rare, arising only when a property contained a great diversity of building types and quality levels.

4 Calculating building costs for different building types was required in 45 properties. Of the 45, more than half involved calculating the costs for single-family buildings using garden apartments as the base.

The cost element numbers created by A.M. Fogarty & Associates, Inc. were based on current costs for the Washington, D.C. area. Using the R.S. Means "Location Factors" from the Means Square Foot Costs Book for 1998, the property-level costs were adjusted by multiplying them by the ratio of the R.S. Means Index for the city where the property is located to the R.S. Means index for Washington, D.C. (which is 0.94). For example, the computed cost for a New York City property would be multiplied by 1.4255 (which is the New York-to-Washington, D.C. index ratio, 1.34 / 0.94).

The costs elements include all parts, labor, and contractor fees for modernization. The cost elements do not include soft costs such as design costs and architect and engineering fees, and do not include PHA costs for managing the modernization projects. ***To account for these costs, all capital needs estimates are inflated by a factor of 17 percent—7 percent for soft costs, and 10 percent for PHA management costs.***

II. Existing Modernization Needs

Existing modernization needs are the costs associated with bringing the property to a condition where it provides decent and sustainable housing with modest amenities. This includes repairing and replacing some systems, upgrading some systems, adding others, and replacing all systems that have reached the end of their useful life.

In addition to assessing the current physical condition of the properties, the inspectors recorded in the inspection booklets information on the *physical* feasibility of upgrading certain observable systems to ensure decent and sustainable housing with modest amenities. The inspector rated the feasibility of upgrading the property by adding amenities or improving the quality of materials in an existing system.

If the property was already in decent sustainable condition with modest amenities, no upgrade feasibility analysis was necessary. In addition, if the layout or size of the buildings or units was not conducive to the upgrades needed, the property was deemed infeasible for the system upgrade.¹

Existing modernization costs are calculated several different ways, depending on the system. For some systems the existing modernization cost is the same as the immediate repair cost required to restore the system to working condition. For some systems modernization involves modest upgrades beyond the immediate repairs, and for some systems modernization involves additions to the systems. In addition, systems that are beyond the end of their useful life are replaced, even if they are still in working order.

¹ Thus, the absence of an upgrade portion of existing modernization cost is either the result of infeasibility or the fact that the property is already in decent sustainable condition. In fact, however, in nearly all cases where upgrade was noted as required, it was also feasible.

An example of a system where the modernization cost equals the immediate repair cost is “roadways.” The modernization cost for roadways would be repairing and replacing deteriorated portions of the roadways.

Systems that may require upgrading even if no immediate repairs are required include kitchens, bathrooms, and windows. Even if these systems are in working order, modest upgrades may be required to make the housing decent and sustainable with modest amenities.

Systems that may require additions as part of existing modernization needs include parking areas, central air conditioning, window grates, and basketball courts. These systems may or may not be present initially. More parking spaces or central air conditioning may be needed to make the housing decent and sustainable with modest amenities.

Systems that have reached the end of their useful life should be replaced as part of the existing modernization even if they are still in working order. For example, a unit boiler that is over 25 years old may still be in working order, but is likely to fail soon and should be replaced.¹

Some system costs are "additive" to the immediate repair cost—the immediate repair would still have to occur before upgrading the system. An example is landscaping. If the immediate repair action requires a portion of the current landscaping to be reseeded, this would have to occur regardless of the landscaping upgrade that adds more shrubs and trees.

Other systems have "instead of" costs. This means that the immediate repair action would not occur if the system were being upgraded. For example, there would be no reason to repair windows that were being upgraded as part of the modernization. Exhibit C-3 lists for each system that can be upgraded, whether its associated cost is additive to, or replaces the immediate repair cost.

Some of the systems can be either “additive” or “instead of” costs. For example, if yards and enclosures are added, the immediate repair costs are “additive.” If yards and enclosures are upgraded, the immediate repairs are “instead of.”

¹ Our original costing system did not include replacing “over-age systems” as a part of existing modernization needs. Instead they were addressed as part of the first-year of accrual. In order to estimate this component of existing modernization needs we took the difference between the first-year accrual costs and the average accrual costs for years 2 through 20, assuming that the average over years 2 through 20 represents normal accrual, and the difference between the two numbers represents the portion of the first year’s accrual that can be attributed to over-age systems.

Exhibit C-3
Listing of Upgrade Systems and Whether the Associated Costs Are
“Additive” or “Instead of” the Immediate Repair Costs

Additive Systems¹

Landscaping
Site Furniture (Add)³
Yards and Enclosures (Add)
Playground/Tot Lot
Paved Pedestrian Area
Fencing
Retaining Wall
Basketball Court
Dumpsters
Pitched Roofs
Exterior Stairs
Building Mounted Site Lights
Porches
Decks
Attached Storage Sheds
Interior Stairways
Window Security Grates
Storm Door
Canopies
Balconies
Central Air Conditioning (Add)
Communication System (Add)
ECAS (Add)
CCTV (Add)

Instead of Systems²

Parking
Site Lighting
Yards and Enclosures (Upg)⁴
Site Furniture (Upg)
Exterior Wall
Windows
Exterior Common Doors
Vestibules
Corridors
Laundry Facilities
Common Rooms
Central Air Conditioning (Upg)
Communication System (Upg)
ECAS (Upg)
CCTV (Upg)
Unit Interiors
Unit Kitchen
Unit Bathrooms

-
- 1 “Additive” systems are those systems whose costs are “additive” to the immediate repair cost—the immediate repair would still have to occur before upgrading the system.
 - 2 “Instead-of” systems are those systems whose costs are “instead of” costs, meaning the immediate repair action would not occur if the system were being upgraded.
 - 3 (Add) means that the system does not exist and needs to be added.
 - 4 (Upg) means that the system exists presently but needs to be upgraded.

The method of calculating modernization costs is similar to that used for immediate repair costs. Cost elements were derived by A.M. Fogarty & Associates, Inc. Exhibit C-4 lists these elements for each system as well as the dimensional multiplier. Systems can be upgraded or added. Unit systems are upgraded as a system group rather than individually, with levels of some systems, all systems, and rehab. For example, for kitchens, upgrading “some systems” includes replacing the cabinet, countertop, sink, range, and refrigerator. Upgrading “all systems” includes replacing the systems mentioned under “some systems” plus replacing the walls and floor. “Rehab” includes replacing those systems mentioned under upgrading “all systems” plus moving partitions and rebuilding walls.

Exhibit C-4: Modernization System Elements				
UPGRADE COSTS	UPGRADE	ADD	UNIT OF MEASURE	ASSUMPTIONS
***SITE UPGRADES				
Landscaping	0.75		Landscape-SF	
Parking	2.08	750.00	Parking-SF;# of new spaces	360 SF per space
Site Lighting	2000.00	3500.00	# Poles	
Site Furniture	250.00	250.00	# Units/UPG; # site units divided by 6 for add	
Yards and Enclosures	485.00	1150.00	# Yards or # Site Units	400 SF
Playground/Tot Lot		50000.00	1 Playground/Tot Lot	
Paved Pedestrian Area		4.50	SF to add	
Fencing		30.00	LF to add	
Retaining Wall		200.00	LF to add	
Basketball Courts		15000.00	1 per project	
Pitched Roofs		25.00	Footprint of buildings to get roofs	
Dumpsters		7000.00	# to add	

***ENVELOPE UPGRADES				
Ext Wall-Plaster	10.00		Ext Wall-Plaster:SF	
Ext Wall-Wood	7.75		Ext Wall-Wood:SF	
Ext Wall-Vinyl	5.50		Ext Wall-Vinyl: SF	
Windows-Small	550.00		# Small Windows	
Windows-Medium	750.00		# Medium Windows	
Windows-Large	1300.00		# Large Windows	
Common Doors	1500.00		# Common Doors	
Exterior Stairs	2500.00		# Stairs	
Bldg Mtd Site Lights		660.00	# Bldg Units divided by 6	
Porches		10000.00	# To Add	8'x16'
Decks		6000.00	# To Add	8'x16'
Storage Sheds		2500.00	# To Add	
Vestibules	12.00		Vestibule-SF	10'x12'
Corridors	15.00		Corridor-SF	6' wide
Stairs	15.00		If Avail: Int Stair-SF; Else 160 times # Stories	

Exhibit C-4: Modernization System Elements				
UPGRADE COSTS	UPGRADE	ADD	UNIT OF MEASURE	ASSUMPTIONS
***ENVELOPE UPGRADES (Cont'd)				
Laundry Room	12.00		SF of Laundry Room	
Laundry Equipment	1000.00	1000.00	# Pieces Laundry equipment (Add: # site units divided by 20 net # existing pieces of equipment)	
Common Rooms	12.00		Common Room-SF	
Security Grates		400.00	# Grates to Add	
Storm Door		400.00	# to Add	
Canopies		2500.00	# to Add	
Balconies		3000.00	# to Add	

***BME UPGRADES				
Central Air Conditioning	5.00	5.25	Bldg Gross Area-SF	
Communication Svstem	1500.00	1500.00	Bldg Units/6	
Emer Call Alarm Svstem	1500.00	1500.00	Bldg Units/6	
Closed Circuit TV	1500.00	1500.00	Bldg Units/6	

UPGRADE COSTS	UPG-SOME	UPG-ALL	REHAB	UNIT OF MEASURE	ASSUMPTIONS
***UNIT UPGRADES					
Interior (ex kitchen. bath)	5.00	14.00	38.00	Total Unit SF-(kit. bath SF)	
Kitchen	5180.00	7680.00	15180.00	1 per unit	
Full Baths	1700.00	2750.00	5500.00	# Full baths	
Half Baths	1100.00	1625.00	3150.00	# Half baths	

After the costs are calculated for the inspected site, units, and buildings, costs are generated for the full property (including uninspected units and buildings) using the same procedures followed for costing immediate repair needs.

- Building upgrade costs for inspected buildings are normalized to a per 2 bedroom equivalent, and unit upgrade costs are normalized to a per square foot cost;
- Costs are generated using one of the five methods¹ that were outlined above for immediate repair needs costs except that the quality ratio that is used for the same type/different quality method is only applied to the portion of the cost that represents the immediate repair needs. Costs to upgrade and add systems are not adjusted by the quality ratio; and
- Adjustments for locations and for soft costs are applied as discussed above.

As part of our data cleaning process, we capped the upper limits for the site-, building-, and unit-level immediate repair needs and existing modernization costs to eliminate the extreme outliers prior to applying the soft costs. This affected only a few properties. Exhibit C-5 presents the limits and the number of properties affected by the cap.

Inspectors ***did not*** make any observations relating to:

- detecting or abating special hazards such as presence of asbestos or lead paint;
- modifications for accessibility for the disabled; or
- improvements for increasing energy efficiency.

Thus, our initial cost estimates did not include these repairs. Costs for these additional components of modernization needs were added to the national estimates based on available data on incidence and costs for each component. In addition, costs for routine maintenance items such as maintaining elevators, or cleaning gutters and chimneys, replacing missing outlets and light fixtures were not included in the cost estimates.

¹ Same type-same quality; same type-different quality; different type building, same quality/different bedsize, different quality/different bedsize.

Exhibit C-5: Outlier Caps

Category	Family		Elderly	
	(Per-Unit) Cap	Number Affected	(Per-Unit) Cap	Number Affected
Immediate Repair Needs^a				
Site	15,000	4	5,000	2
Building	7,500	4	7,000	3
Unit	7,500	8	5,000	2
CME	10,000	1	NA	
Existing Modernization Costs^b				
Site	25,000	6	7,500	3
Building	20,000	5	10,000	5
Unit	25,000	7	25,000	3

a Immediate Repair Needs are the costs needed to repair or replace systems that are not in working order.

b Existing Modernization Needs are the costs needed to provide decent and sustainable housing with modest amenities.

Puerto Rico Upgrades and Additions

The housing stock in Puerto Rico is very different from the rest of the sample. In order to make it more comparable to the rest of the public housing stock, each property in Puerto Rico was assigned the following upgrades and additions in the cost estimates:

- Building Envelope system window upgrades
- Unit system window air conditioners, if absent
- Unit system domestic hot water generators, if absent
- Unit system range, with hood, if absent
- Unit system refrigerator, if absent.

III. Estimating Accrual of Repair and Replacement Costs

Accrual cost estimates are the total amount a property will need to cover expected repairs and replacements for each Observable System over each of the next 20 years. Each system was given either a repair or a replacement cost depending upon the standard wear of the system. For example, boilers are expected to be replaced after a certain number of years, but landscaping only needs periodic maintenance. Some systems were deemed inappropriate for accrual estimates because they generally will not need replacement or standard maintenance over the 20-year horizon used for this study. An example is the site-level domestic hot water lines. Over time, a portion of the lines may need to be replaced, but this is not an expected occurrence. The repair or replacement system cost is based on the same algorithm used for the immediate repair needs costings.

In addition to a repair/replacement cost, each accrual system was assigned an expected useful lifetime (or in the case of items which will be repaired, "action-intervals" are assigned).¹ For systems requiring replacement over time, the useful life is the age the system is expected to be when it must be replaced because it is worn-out or approaching failure. Boilers are expected to last 25 years. This is the expected life for the boiler systems. Site landscaping is not expected to wear out, but will need to be reseeded and replanted every 8 years. This is the action interval (rather than expected life) for landscaping. Exhibit C-6 lists for each system involved in accrual, the action level appropriate to accrual, and the useful life (or action interval). Useful lives for some of the systems differ based on the residential composition of the units. For example, for some systems such as doors or common kitchens, action intervals depend on property occupancy—they are shorter for family developments than for elderly developments. For other systems, such as yards and fencing, useful lives are shorter in high-density family buildings than low-density family buildings. For some unit systems, such as kitchen appliances and flooring, useful lives were greater the number of bedrooms (and, typically, occupants in the unit). The action intervals were defined in consultation with the Negotiated Rulemaking Committee that discussed the Capital Need Formula from March to August 1999.

For each of the next 20 years, for each accrual system, we tested whether the system would reach the end of its useful life (or action interval) that year.² As the starting point, we used the system ages where

1 The basic reference for expected lives was Appendix B, "Accrual Actions and Expected Lives" from *Future Accrual of Capital Repair and Replacement Needs of Public Housing, Final Report*, prepared for HUD by ICF, Inc., April 1989 as an update of the Abt Associates Inc. public housing study (Dixon Bain et al., *Study of the Modernization Needs of the Public and Indian Housing Stock* (Cambridge, MA: Abt Associates Inc., March 1988). Abt Associates Inc. staff experienced in conventional residential building construction and management altered these lifetimes for some systems. HUD staff and members of the Negotiated Rules Making Committee further refined the expected life tables.

2 As discussed above, a portion of the first year's accrual was added to the estimate of existing modernization needs to account for over-age systems. Thus, the accrual estimates used in the analysis cover only years 2 through 20, since the first-year accruals is now assumed to be the average across those years.

they were collected by the inspector; otherwise, we estimated system age to be the average age of the buildings in the project. We assumed, however, that any system that needed to be replaced as part of the existing modernization, was indeed replaced. Therefore, the age of such systems was set back to zero. In addition, we assumed that if a moderate or major repair action occurred as part of the repair of immediate needs, then the system age was also reset to zero. (Exceptions to this rule are pole-mounted lighting, emergency generators, hot air furnaces, sheds, porches, and decks, where only major repairs or system replacement reset age to zero.) The age was then increased for each accrual year. In any year that a system's accrual age equals its expected life, then the repair/replace cost was added into the accrual total for that year. The accrual yearly totals were calculated on the sites, units, and buildings that were actually inspected. These costs were then scaled up to reflect the total property. Accrual costs were scaled to property totals based on the proportion of the property's total square footage the inspected units and buildings represented. The property totals were then regionally adjusted as discussed previously, and the adjustment for soft costs and PHA management costs was made. Accrual costs were based on 1998 current dollars.

Exhibit C-6
Life Expectancies and Repair/Replace Action Levels for Accrual Systems

System	Life Expectancy			Repair Action Level
	Elderly	Family—Low Density ^a	Family—High Density	
Site Systems				
Landscaping	8	8	6	MIN
Roadways	20	20	16	MAJ
Parking Lots	20			MAJ
Parking Garages	20			MAJ
Paved Pedestrian	20	20	16	MAJ
Curbing	20			MAJ
Fencing-Chain Link	20	20	16	REP
Fencing-Wrought Iron	30	30	24	REP
Fencing-Wood	15	15	12	REP
Fencing-Concrete	30	30	24	REP
Retaining Walls-Concrete	20			MOD
Retaining Walls-RR Ties	15			MOD
Site Drainage	20			MOD
Pole Mounted Lighting	20			MAJ
Site Furniture	15	15	12	REP
Yards and Enclosures	20	20	16	REP
Dumpster	15	15	12	REP
Basketball	15	15	12	MOD
Domestic Hot Water Distribution	40			REP
Domestic Cold Water Distribution	40			REP
Sewage Ejector	25			REP
Building Systems				
Building Foundation	50			MIN
Exterior Wall	10			MIN
Roof-Membrane	25			MAJ
Roof-Shingles	25			MAJ
Roof-Builtup	25			MAJ
Roof Covering-Tile	30			MAJ
Roof Covering-Metal	30			MAJ
Parapet Wall	10			MOD
Chimney	25			MIN
Penthouse	25			MAJ
Roof Drainage	25			REP
Windows	40	30	30	REP
Security Grates	40			REP
Ext Common Door	30	20	16	MAJ
Unit Entry Door	30	20	16	MIN
Storm/Screen Door	15	10	8	REP
Canopies	20			MOD
Exterior Stairs	20	16	16	MIN

System	Life Expectancy			Repair Action Level
	Elderly	Family—Low Density ^a	Family—High Density	
^a The Family designator was split into high and low density at the property level with low density defined as fewer than 10 units per building and high density as 10 or more units per building.				
Bldg Mounted Site Lights	12	10	8	MOD
Fire Escapes	8			MOD
Balconies	40			REP
Porches	40			REP
Decks	25			REP
Sheds	40			REP
Vestibules	10	8	8	MIN
Corridors	10	8	8	MAJ
Stairways	10	8	8	MIN
Interior Lights	25	20	16	MOD
Mail Facilities	30	15	12	REP
Laundry Rooms	15	10	8	MOD
Common Rooms	10	8	8	MOD
Common Kitchen	25	15	12	MOD
Underground Garage	20			MAJ
BME Systems				
Heating Riser	30			MOD
Gas Distribution	40			MOD
Dom Hot/Cold Water	30			MAJ
Sanitary Dist	10			MIN
Fire Sprinkler System	20			MIN
Sump Pump	10			REP
Compactor	15	10	10	REP
Central Vent/Exhaust	25			MAJ
Central Air	20	15	15	REP
Emergency Lights	35			REP
Smoke Detector (Hardwired)	30	20		REP
Communication System	30			REP
Building ECAS	30			REP
Building CCTV	30			REP
Building Furnace	25			REP
Building Boiler	25			REP
Boiler Room Piping	50			REP
Boiler Equipment	25			REP
Boiler Room Controls	25			REP
DHW Generation	15			REP
Shaftway Doors	20	15		REP
Elevator Cabs	30	15		REP
Elevator Machinery	30	25		REP
Emergency Generator	35			REP
Purchased Steam Supply	30			MAJ

System	Life Expectancy			Repair Action Level
	Elderly	Family—Low Density ^a	Family—High Density	
Heat Exchanger	35			MAJ
Cold Water Supply	30			REP
Unit Systems	Small Bedroom (0-1 BR)	Medium Bedroom (2 BR)	Large Bedroom (3 or more BR)	
Unit-Carpet	10	7	6	REP
Unit-Floor Resilient	20	15	12	MAJ
Kitchen Floor	15	10	8	MAJ
Kitchen Cabinet	20	15	12	REP
Kitchen Range	20	15	12	REP
Refrigerator	18	12	12	REP
Bath Floor-Ceramic	50	35	28	REP
Bath Floor-Resilient	20	10	8	MAJ
Bath Fixtures	30	20	16	REP
Bath Accessories	30	15	12	REP
Bath Vanities	30	15	12	REP
Unit HVAC	20			REP
Radiation ^b	25	20	20	REP
Unit Boiler	25			REP
Unit Furnace	20			REP
Unit DHW Generation	10			REP
Temperature Control	25			REP
Wall/Air Conditioner	15	12	12	REP
Bell/Intercom	30	20	20	REP
Unit CCTV	30			REP
Unit ECAS	30			REP
Unit Smoke Detector (Hardwired)	30	15	15	REP

b Electric only.

Appendix D:

Coefficients of Recommended Models

This appendix describes the set of recommended models for estimating inspection-based existing modernization needs and accrual needs. Regression coefficients of the need predictors are shown in Exhibit D-1 and Exhibit D-2.¹

The signs and magnitudes of the regression coefficients associated with most of the needs predictors are largely consistent with conventional wisdom and our expectations. Due to collinearity between some of the predictor variables, it is difficult to interpret a few of the estimated coefficients in the models. For instance, coefficients for the R.S. Means cost adjustment factor and some of the region variables have signs (positive or negative) whose interpretations are not readily obvious. Also, the magnitude of some of these coefficients varies drastically across models. They might capture effects that are not directly measured by other variables in the models. However, the inclusion of these predictors in the models is crucial, because they capture the unobservable heterogeneities among the developments and prevent these from biasing the other predictor estimates in the models.

We do not intend to interpret every coefficient here. Rather, we will discuss some of the important ones presented in Exhibit D-1 and Exhibit D-2.

For existing modernization needs, the major findings are as follows:

- Overall, judging from the level of precision of the coefficient estimates, the average number of bedrooms per unit in a development is the major predictor for existing modernization needs. Everything else being equal, one additional bedroom per unit raises per-unit existing modernization needs by about \$2,812 for developments in housing authorities with fewer

¹ The regression coefficients were estimated with the Weighted-Least-Square (WLS) procedure, using the sample weights. WLS, rather than Ordinary-Least-Square (OLS), is preferable because it can reduce the possible biases caused by the sampling scheme (i.e., design effects) and missing regressors. WLS is especially pertinent if the sample selection probability is correlated with the dependent variable in the model—in this study, we have over-sampled developments with high capital needs. For details, see Phillip S. Kott, 1991, "A Model-Based Look at Linear Regression with Survey Data." *The American Statistician*, Vol. 45(2): 107-112; William H. DuMouchel and Greg J. Duncan, 1983, "Using Sample Survey Weights in Multiple Regression Analyses of Stratified Samples." *Journal of the American Statistical Association*, Vol. 78 (383): 535-543. In addition, to correct for heteroscedasticity in the regression model's error terms introduced by the sample weights, we reported the Huber-White robust standard errors. Halbert White, 1980, "A Heteroscedasticity-Consistent Covariance Matrix Estimator and a Direct Test for Heteroscedasticity." *Econometrica*, Vol. 48: 817-838.

than 250 units and \$4,776 for housing authorities with 250 or more units.

• **Exhibit D-1: Recommended Models for Predicting Capital Needs:
Regressions (weighted) of Per-unit Inspection-Based Existing Modernization Needs**

Model 1-a		
<i>Developments in Housing Authorities with Fewer than 250 Units</i>		
Predictor	Coefficient	Standard Error^a
Average Number of Bedrooms per unit	2,812.4 *	1,574.7
Total Number of Units at the Development	10.9	41.2
Building Age > 20 years	1,749.3	2,585.5
R.S. Means Location Adjustment Factor	-32,183.0 **	12,271.2
Non-metropolitan Location	3,155.6	2,756.3
South Census Region	2,801.0	3,759.9
West Census Region	3,892.2	4,430.9
Midwest Census Region	-938.2	3,302.1
Constant	34,650.5 **	14,584.6
Number of observations from Inspection Sample:	126	
R-squared Statistic:	0.20	
<i>Developments in Housing Authorities with More than 250 Units</i>		
Predictor	Coefficient	Standard Error^a
Average Number of Bedrooms per unit	4,775.5 ***	713.8
Total Number of Units at the Development	9.7 ***	2.8
Building Age > 20 years	5,528.5 ***	1,537.7
R.S. Means Location Adjustment Factor	-7,571.4	8,713.9
Non-metropolitan Location	3,581.4 *	1,877.1
South Census Region	110.8	2,447.7
West Census Region	-518.7	1,976.1
Midwest Census Region	346.2	1,771.4
Constant	9,637.5	10,136.6
Number of observations from Inspection Sample:	442	
R-squared Statistic:	0.16	

Notes: ^a Huber-White robust standard errors are used to correct for heteroscedasticity introduced by sample weights.

*** Statistically significant at the 99 percent level.

** Statistically significant at the 95 percent level.

* Statistically significant at the 90 percent level.

Northeast Census Region is the reference category.

Excludes developments of New York City, Chicago, and Puerto Rico housing authorities in the inspection sample.

**Exhibit D-2: Recommended Models for Predicting Capital Needs:
Regressions (weighted) of Per-Unit Inspection-based Average Annual Accrual Needs**

Model 3-a		
<i>Developments in Housing Authorities with Fewer than 250 Units</i>		
Predictor	Coefficient	Standard Error^a
Average Number of Bedrooms per unit	227.2 *	119.1
Low-Density Factor	170.3 ***	41.8
Building Age	-8.6 **	4.0
Family Occupancy Type	132.0	200.6
R.S. Means Location Adjustment Factor	-1,054.6 **	525.6
Non-metropolitan Location	-119.3	93.6
South Census Region	-420.6 **	187.0
West Census Region	133.4	174.4
Midwest Census Region	-311.8 *	163.4
Constant	2,684.0 ***	594.7
Number of observations from Inspection Sample:	126	
R-squared Statistic:	0.45	
<i>Developments in Housing Authorities with More than 250 Units</i>		
Predictor	Coefficient	Standard Error^a
Average Number of Bedrooms per unit	328.8 ***	55.9
Low-Density Factor	96.2 ***	21.7
Building Age	-7.7 ***	2.0
Family Occupancy Type	173.3	108.4
PHA with More than 6,600 Units	-141.2 **	61.3
R.S. Means Location Adjustment Factor	-202.2	345.6
Non-metropolitan Location	-114.6 *	66.6
South Census Region	37.1	101.1
West Census Region	-96.7	79.4
Midwest Census Region	63.4	68.3
Constant	1,306.9 ***	391.0
Number of observations from Inspection Sample:	442	
R-squared Statistic:	0.45	

Notes: ^a Huber-White robust standard errors are used to correct for heteroscedasticity introduced by sample

weights.

*** Statistically significant at the 99 percent level.

** Statistically significant at the 95 percent level.

* Statistically significant at the 90 percent level.

Northeast Census Region is the reference category.

Excludes developments of New York City, Chicago, and Puerto Rico housing authorities in the inspection sample.

- As expected, building age has an impact on the per-unit existing modernization needs, especially for properties in housing authorities with 250 or more units. We found that developments in such housing authorities with a building age of at least 20 years are, on average, associated with \$5,529 more in existing modernization needs per unit, compared with newer properties with similar attributes.
- Every additional unit in a development tends to raise per-unit existing modernization needs by approximately \$10 holding all other characteristics constant.

For accrual needs models, the major findings are as follows:

- Every additional bedroom increases per-unit accrual needs by about \$227 for developments in housing authorities with fewer than 250 units and \$329 for housing authorities with 250 or more units, holding all other factors constant.
- Another important determinant of per-unit accrual needs is the low-density factor, which measures the extent to which the buildings in a development average fewer than 5 units. (In computation, it is calculated as 5 minus the number of units per building, with resulting values below zero set to zero.) It serves as a proxy for the impact of scattered-site projects on capital needs.
- Developments in very large housing authorities (more than 6,600 units) tend to be associated with a lower (\$136) per-unit accrual need, everything else being equal. This finding is consistent with the univariate results reported in Exhibit 2-1 of Chapter Two, and probably reflects the fact that properties in those housing authorities are mostly equipped with relatively old building systems, which need to be replaced as part of the modernization effort. Thus in the first few years following modernization, accrual needs are relatively low.

The recommended models use exactly the same set of need predictors recommended to HUD for the Negotiated Rule-Making Committee Meetings held in the summer of 1999. The model coefficients reported here, however, made use of a more complete and up-to-date database. Specifically, we have updated the information of one data element (i.e. the non-metropolitan location status of each sample property). This increased the usable sample from 525 to 568 properties. The sample of small PHAs increased from 95 to 126 properties, and the sample of large PHAs from 430 to 442. The models now yield estimates that are more robust. The resulting coefficient estimates are slightly different from those reported to the HUD Negotiated Rule-Making Committee Meeting. But, overall, these differences are essentially negligible and show no material impact in terms of potential funding allocation by housing authority size categories. As an illustration, Exhibits D-3 and D-4 compare the estimates of existing

modernization needs and accrual needs by housing authority size category at the per unit (Exhibit D-3) and total (Exhibit D-4) levels. As the exhibits show, in each size category the differences are very small.

**Exhibit D-3: Comparison of Per-Unit Model-Based Capital Need Estimates
For the 1999 CGP/CIAP Universe**

Public Housing Authority Size	Total Units ^a	Per-Unit Existing Modernization Needs		Per-Unit Average Annual Accrual Needs	
		Negotiated Committee	Final Estimate	Negotiated Committee	Final Estimate
Less than 250 units	203,687	\$12,613	\$12,658	\$1,800	\$1,772
250 to 1,249 units	336,648	\$16,931	\$17,017	\$1,648	\$1,649
1,250 to 6,600 units	342,266	\$18,466	\$18,488	\$1,671	\$1,671
More than 6,600 units ^b	204,533	\$23,060	\$23,069	\$1,557	\$1,564
New York City ^c	160,209	\$22,967	\$22,967	\$1,886	\$1,886
Chicago ^c	38,788	\$26,852	\$26,852	\$1,381	\$1,381
National Total	1,286,131	\$18,681	\$18,718	\$1,685	\$1,682

a Unit counts based on the HUD Master Universe file for June 1999.

b Excluding units in New York City and Chicago housing authorities, but including units in Puerto Rico.

c Estimates based on unit counts from the HUD Master Universe file and per-unit need estimates from the inspection sample.

**Exhibit D-4: Comparison of Total Model-Based Capital Need Estimates
For the 1999 CGP/CIAP Universe**

Public Housing Authority Size	Total Units ^a	Existing Modernization Needs		Average Annual Accrual Needs	
		Negotiated Committee	Final Estimate	Negotiated Committee	Final Estimate
Less than 250 units	203,687	\$2,569,050,926	\$2,578,361,860	\$366,589,692	\$360,953,187
250 to 1,249 units	336,648	\$5,699,825,179	\$5,728,615,775	\$554,899,118	\$555,179,453
1,250 to 6,600 units	342,266	\$6,320,392,072	\$6,327,732,638	\$571,863,881	\$571,954,000
More than 6,600 units ^b	204,533	\$4,716,478,018	\$4,718,442,859	\$318,365,398	\$319,871,450

New York City ^c	160,209	\$3,679,503,620	\$3,679,503,620	\$302,163,581	\$302,163,581
Chicago ^c	38,788	\$1,041,543,510	\$1,041,543,510	\$53,555,225	\$53,555,225
National Total	1,286,131	\$24,026,793,325	\$24,074,200,262	\$2,167,436,895	\$2,163,676,896

a Unit counts based on the HUD Master Universe file for June 1999.

b Excluding units in New York City and Chicago housing authorities, but including units in Puerto Rico.

c Estimates based on unit counts from the HUD Master Universe file and per-unit need estimates from the inspection sample.